Generators & Regulators - New Beetle

DESCRIPTION

Bosch alternators are conventional 3-phase, self-rectifying type alternators. Bosch voltage regulators are transistorized and integral with alternator. Voltage regulators are serviceable.

ADJUSTMENTS

BELT TENSION

Serpentine belt tension is automatically adjusted by tensioner.

DRIVE BELT ROUTING

NOTE: Serpentine belt is self-adjusting. For drive belt routing, see Fig. 1 or Fig. 2 .

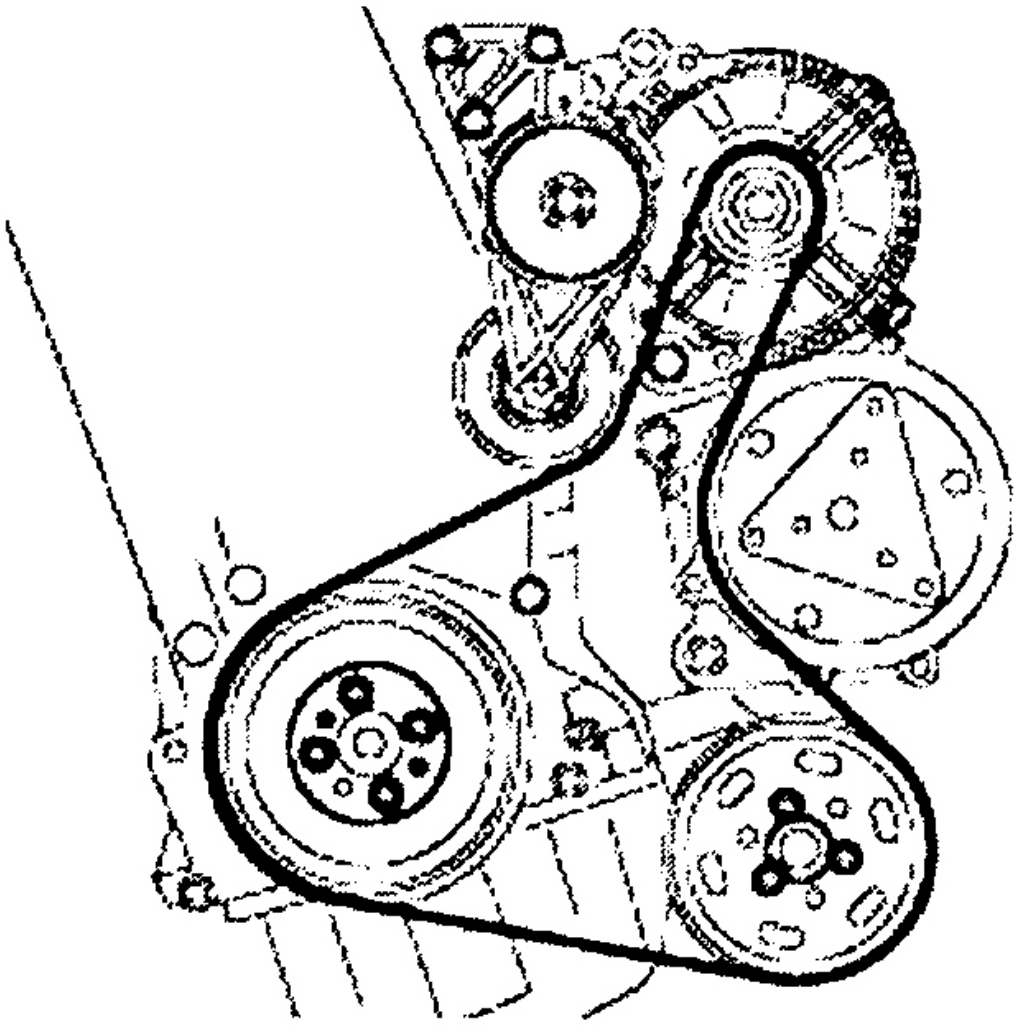

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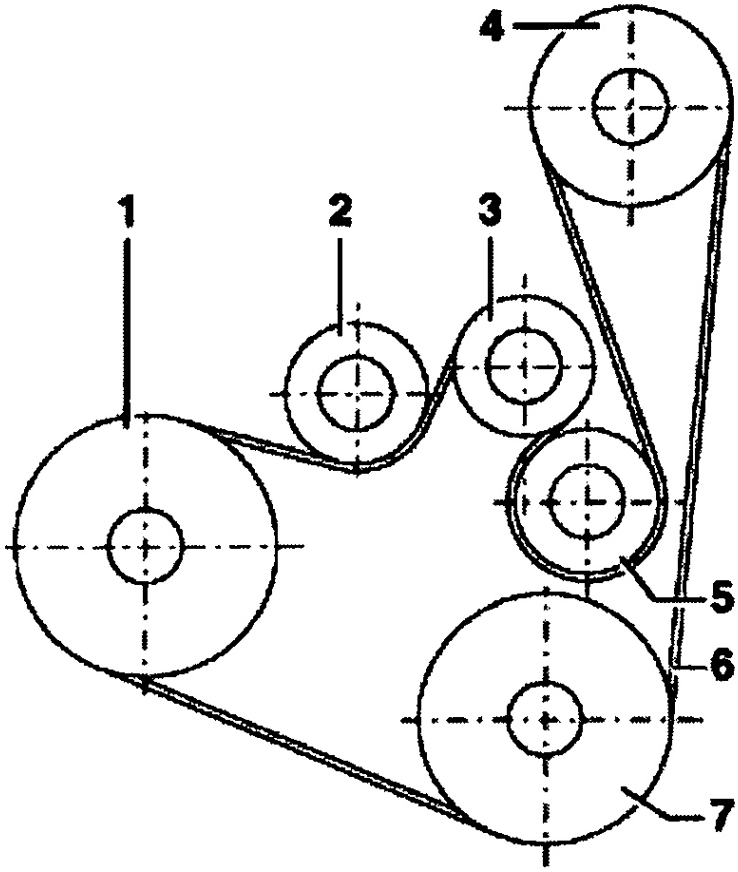
Fig. 1: Drive Belt Routing (Except 1.9L - ALH & BEW)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



1- Vibration damper/pulley
2- Tensioner
3- Pulley-generator
4- Pulley-power steering pump
5- Idler pulley
6- Ribbed belt
7- Pulley-A/C compressor

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Fig. 2: Drive Belt Routing (1.9L - ALH & BEW)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

TROUBLE SHOOTING

PRELIMINARY INSPECTION

Verify customer complaint by operating system. Visually inspect for obvious signs of mechanical and electrical damage. Check generator belt tension and condition. Ensure that battery voltage is within specifications. Following manufacturers instructions for load tester, load test battery. See **LOAD TEST** under ON-VEHICLE TESTING. Inspect for blown fuses and damaged relays. For fuse and/or relay identification, see **WIRING DIAGRAMS** . Verify ground connection integrity between engine, body, battery and generator. Check for damaged wiring harnesses and/or switches. Check for a broken or partially broken wire inside insulation, which could cause system malfunction but prove good in a continuity/voltage check with system disconnected. Ensure any aftermarket electronic equipment is properly installed. If fault is found, repair as necessary. If no fault is found, check for conditions that might cause an intermittent situation.

SYSTEM TESTS

GENERATOR WARNING LIGHT DOES NOT GO OUT WITH SPEED INCREASE

1. Turn ignition switch to OFF position. Disconnect D+ terminal at generator. Turn ignition switch to ON position. Observe GEN warning light. If warning light illuminates, go to next step. If warning light does not illuminate, go to **GENERATOR** .
2. Turn ignition switch to OFF position. Disconnect Blue wire from instrument cluster terminal T32a/12. Turn ignition switch to ON position. Observe GEN warning light. If warning light illuminates, replace faulty instrument cluster. If warning light does not illuminate, repair short to ground in D+ circuit between generator, ignition switch and instrument cluster. See **WIRING DIAGRAMS** .

GENERATOR WARNING LIGHT DOES NOT ILLUMINATE WITH IGNITION ON

1. Ensure generator belt tension and battery voltage are okay. Verify ground connection integrity between engine, body, battery and generator. Repair as necessary.
2. Turn ignition switch to OFF position. Disconnect D+ terminal at generator. Using a jumper wire, ground D+ terminal. Turn ignition switch to ON position. Observe GEN warning light. If warning light illuminates, go to next step. If warning light does not illuminate, check wiring using a wiring diagram. Verify GEN warning light operation in instrument panel. See **WIRING DIAGRAMS** .
3. Turn ignition switch to OFF position. Remove voltage regulator. See **VOLTAGE REGULATOR** under REMOVAL & INSTALLATION. Check condition and length of brushes. See **VOLTAGE REGULATOR BRUSH SPECIFICATIONS** table under BENCH TESTING. If brushes are within specification, replace generator. See **GENERATOR** under REMOVAL & INSTALLATION. If brushes are out of specification, replace brushes or voltage regulator.

ON-VEHICLE TESTING

GENERATOR

1. Ensure generator belt tension and mounting are okay. On vehicles equipped with 1.9L TDI, check function of generator pulley freewheeling clutch (if equipped). Check ground connection between engine, body, battery and generator. Repair as necessary.

2. Turn ignition switch to OFF position. Attach SUN VAT 40 Black lead to battery negative terminal. Attach SUN VAT 40 Red lead to battery positive terminal. Clamp SUN VAT 40 Green test lead to battery ground cable.
3. Turn on all electrical components. Start engine, and maintain engine speed of 1500-2000 RPM. Observe SUN VAT 40 ammeter reading. If charging current is 75 amps or more, generator and voltage regulator are functioning properly.
4. If charging current is less than 75 amps, check battery fluid specific gravity. If specific gravity is less than 1.22, generator is malfunctioning. Repair or replace as necessary. If battery fluid specific gravity is 1.22 or more, repair as necessary.

LOAD TEST

WARNING: Dispose of electrolyte (sulfuric acid/water mixture) properly. Waste electrolyte must only be disposed of in appropriate waste disposal sites. Refer to local regulations pertaining to electrolyte disposal.

WARNING: DO NOT load test batteries which are gassing. There is a risk of explosion.

NOTE: Manufacturer recommends performing electrolyte specific gravity test, in order to determine battery overall condition.

NOTE: It is not necessary to remove battery from vehicle, or disconnect battery terminals.

Connect tester cable clamps to battery terminal. Ensure clamps have a good contact with battery terminals. Connect battery tester according to tool manufacturer's instructions. Load test battery at approximately one-half cold-cranking amperage rating for 15 seconds while observing battery voltage. If voltage reading is 9.6 volts or more, battery is okay. If voltage reading is less than 9.6 volts, charge battery and retest. If loaded battery voltage is still less than 9.6 volts after charging battery, replace battery. See **BATTERY** under REMOVAL & INSTALLATION.

NO LOAD TEST

CAUTION: Battery cell caps must be bolted in tightly when charging, measuring voltage or performing load tests.

NOTE: If no load voltage is to be measured with battery installed in vehicle, first disconnect ground strap.

NOTE: Vehicle must not be started or driven with tested battery for at least 2 hours before taking measurements. During this time, DO NOT allow load or additional charge to be applied to battery.

With battery installed, and ignition switched off, check voltage between battery terminals with voltmeter. If no load voltage is 12.5 volts, or higher, battery is okay. If no load voltage is lower than 12.5, recharge battery, and repeat procedure. If battery voltage is still less than 12.5 after charging battery, replace battery. See **BATTERY** under REMOVAL & INSTALLATION.

BENCH TESTING

BRUSHES

Remove voltage regulator from back of generator. Ensure brushes are longer than .20" (5 mm). If necessary, install new brushes. DO NOT allow solder to run into strands of brush leads. See **Fig. 3** and **Fig. 4** .

VOLTAGE REGULATOR BRUSH SPECIFICATIONS

Application	In. (mm)
New	0.5 (12)
Wear Limit	0.2 (5)
Tolerance	0.04 (1)

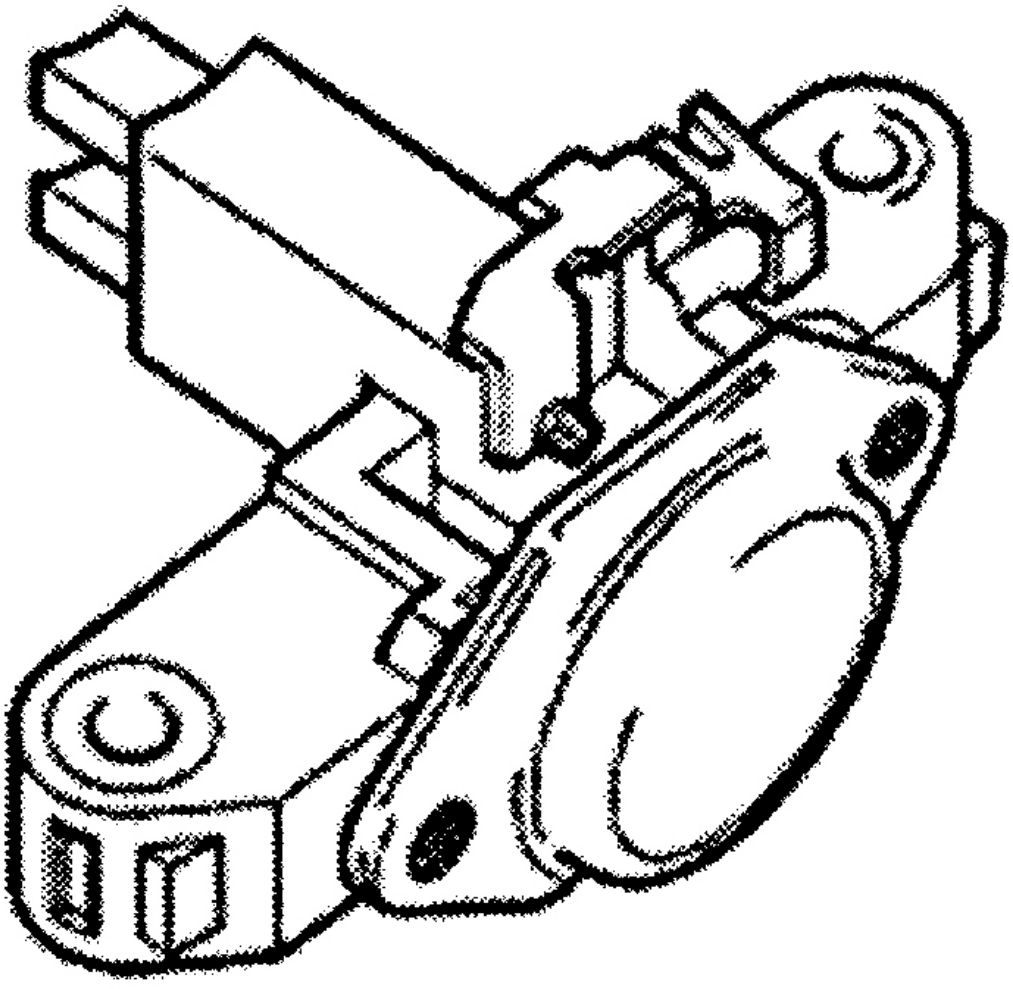

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Fig. 3: Checking Generator Brushes (Models Up To May 1999)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

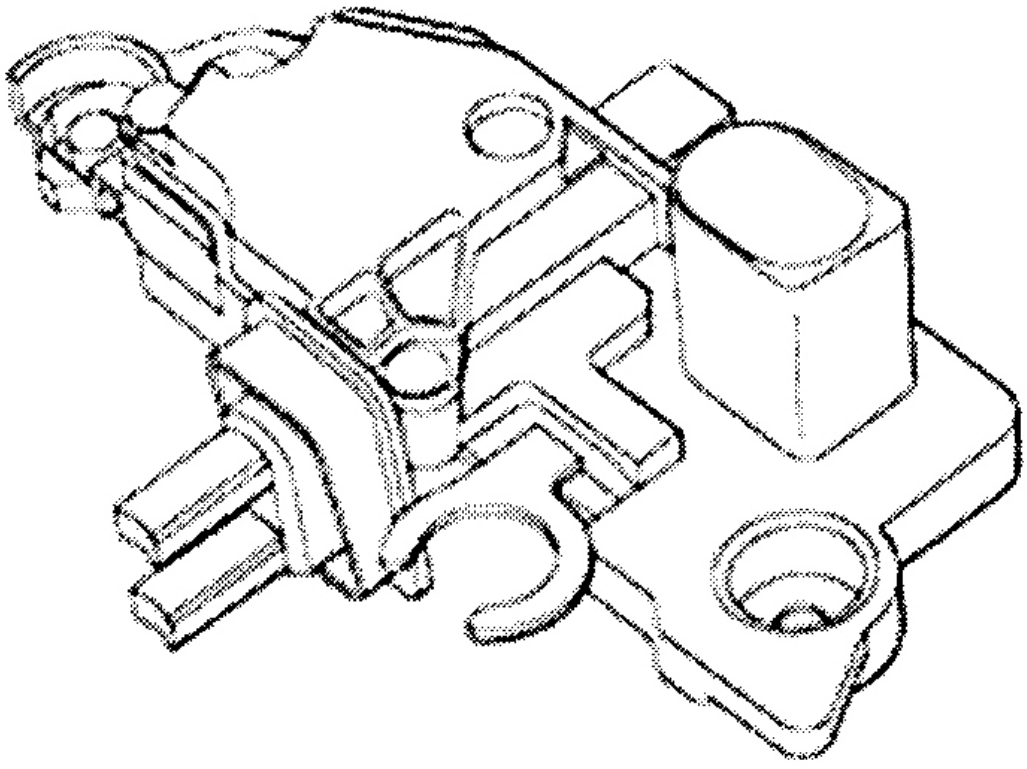

Fig. 4: Checking Brushes (Models From June 1999 & On)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

REMOVAL & INSTALLATION

WARNING: Vehicles are equipped with air bag supplemental restraint system. Before attempting any repairs involving steering column, instrument panel or related components, see SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM in appropriate AIR BAG RESTRAINT SYSTEMS article.

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

BATTERY

CAUTION: After installing battery, check to ensure battery is seated securely. If battery is not secured properly, the following will result:

- **Shortened battery service life due to vibration damage.**
- **Battery cell and plate damage.**
- **Electrolyte leakage due to battery case damage.**
- **Poor collision safety.**

Removal & Installation (Convertible From Aug 2002 & Sedan From Dec 2002)

1. Disconnect battery. Press retainer clips (arrows), and pull upward to remove battery shield. See **Fig. 5** . Remove bolt (1) and battery hold-down (2). See **Fig. 6** .
2. **NOTE: DO NOT disconnect power steering hoses from reservoir.**

   Remove power steering fluid reservoir retaining clip bolt (1). See **Fig. 7** . Remove clip holder. Remove bolt (2) attaching air cleaner-to-battery platform.
3. **CAUTION: Ensure power steering fluid reservoir, air cleaner or other components are not damaged upon removal of battery. Carefully move reservoir, air cleaner and other components away from battery area as necessary for clearance.**

   Carefully slide battery to left, and lift from battery tray. Remove plastic retainer clip (1). See **Fig. 8** . Gently press down and sideways (arrow), and remove battery shield. If necessary, remove bolts (1) to remove battery carrier. See **Fig. 9** .
4. To install, only use batteries with a 10.5 mm battery foot strip. Install battery so lug of battery carrier (arrow) engages in battery groove (1). See **Fig. 10** . Ensure battery can not move left or right when in position.
5. **NOTE: The battery is correctly installed when the center groove in the battery foot strip aligns with threaded hole in the battery carrier (arrows). See Fig. 11 .**

   On batteries with hose for central venting, ensure venting hose is not kinked. Only then can battery vent freely. On batteries without hose for central venting, ensure opening on upper side of battery cover is not blocked.
6. To complete installation, reverse removal procedure. Install battery hold-down and bolt (2). See **Fig. 6** . Tighten bolt to specification. See **TORQUE SPECIFICATIONS** . Tighten power steering fluid reservoir retaining clip bolt and air cleaner-to-battery platform to specification. See **TORQUE SPECIFICATIONS** .

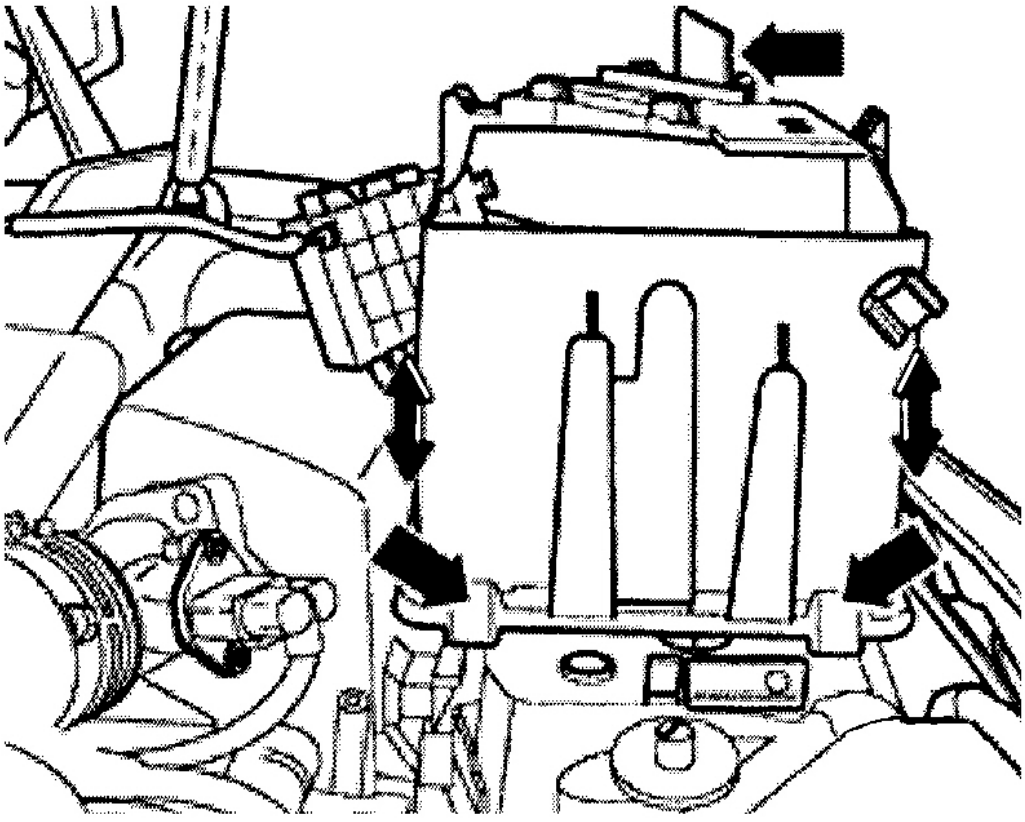

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Fig. 5: Identifying Battery Shield Retaining Clips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

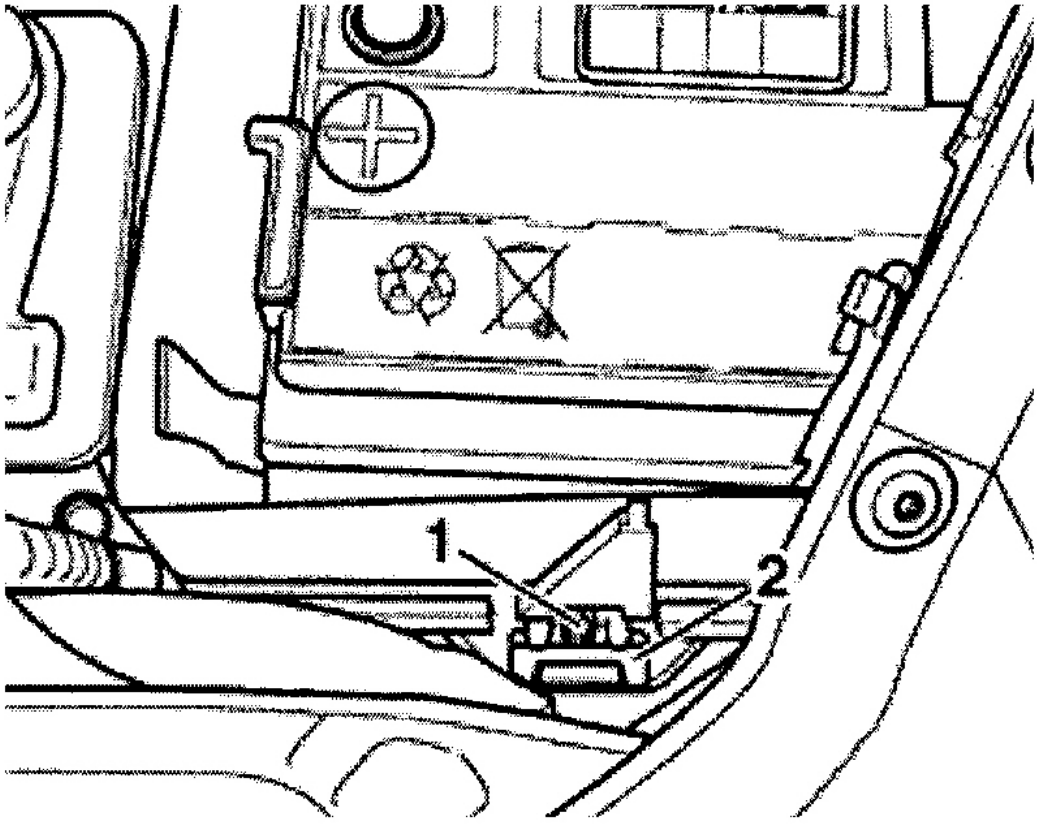

Fig. 6: Locating Battery Hold-Down & Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

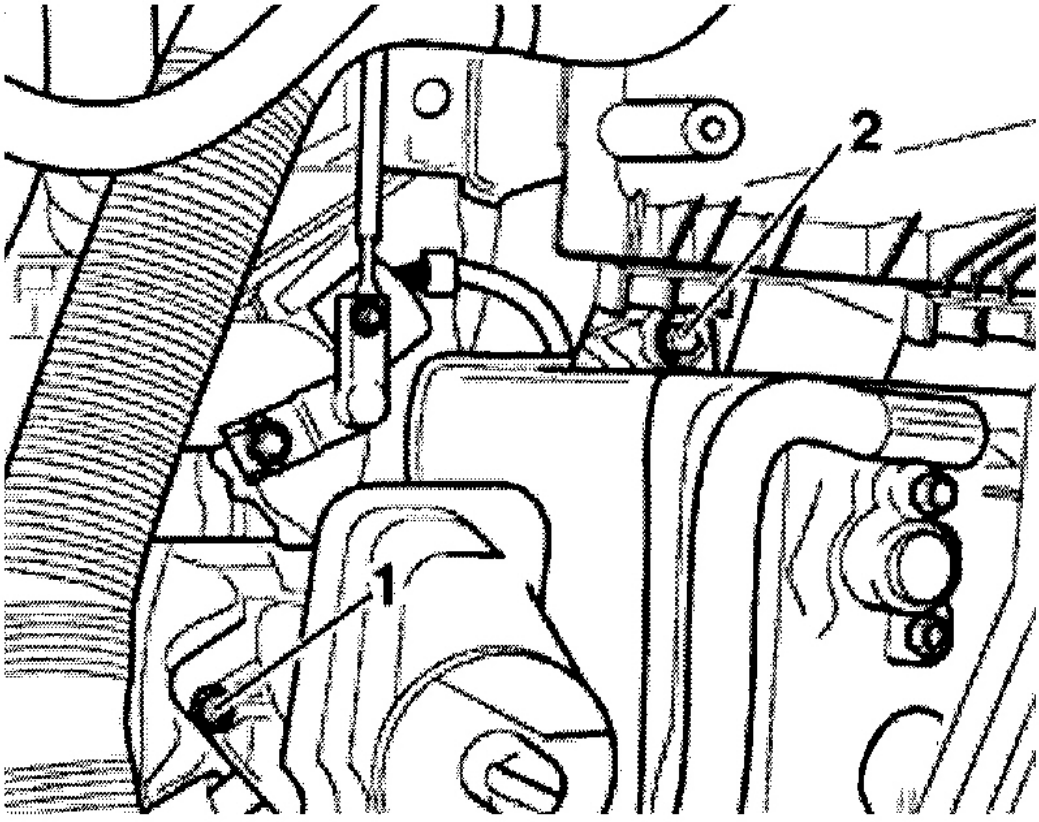

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Fig. 7: Removing Battery (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

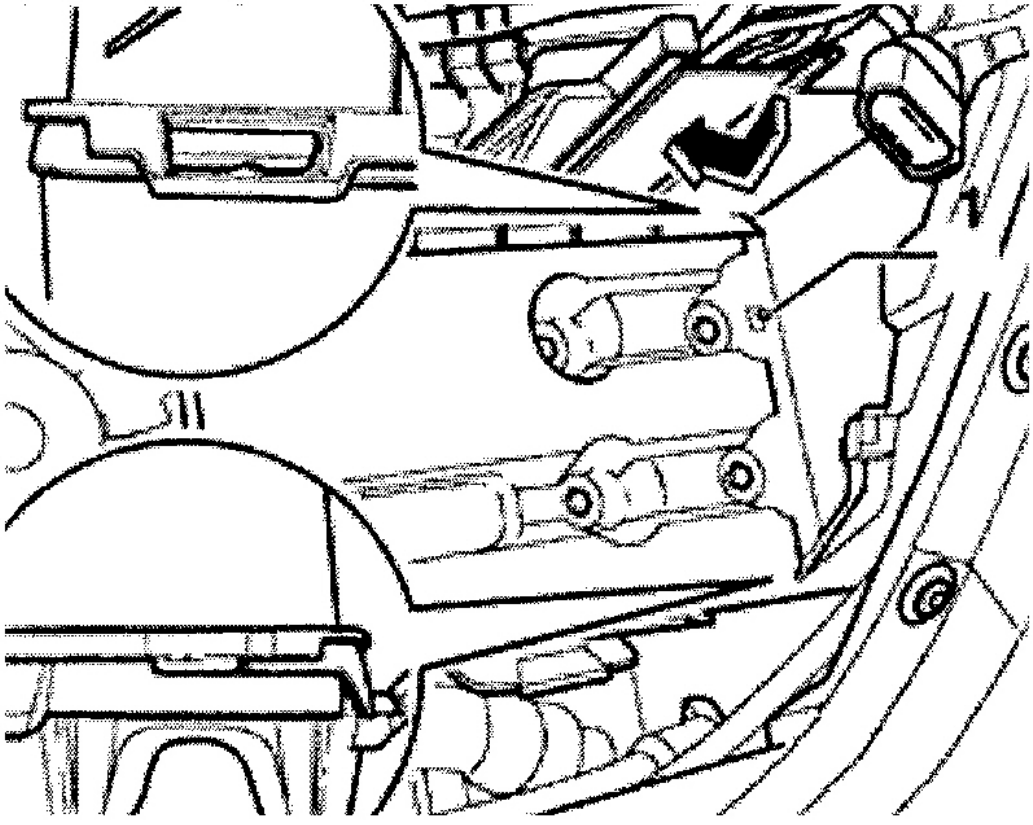

Fig. 8: Removing Battery (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

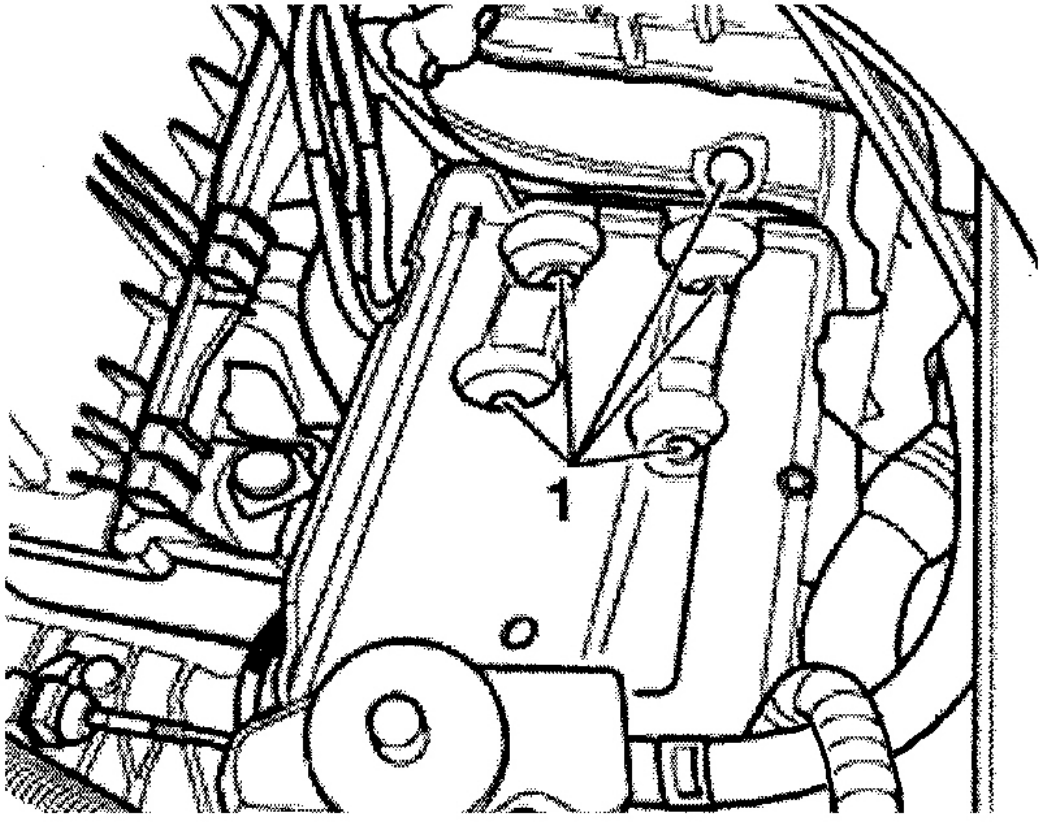

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Fig. 9: Locating Battery Carrier Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

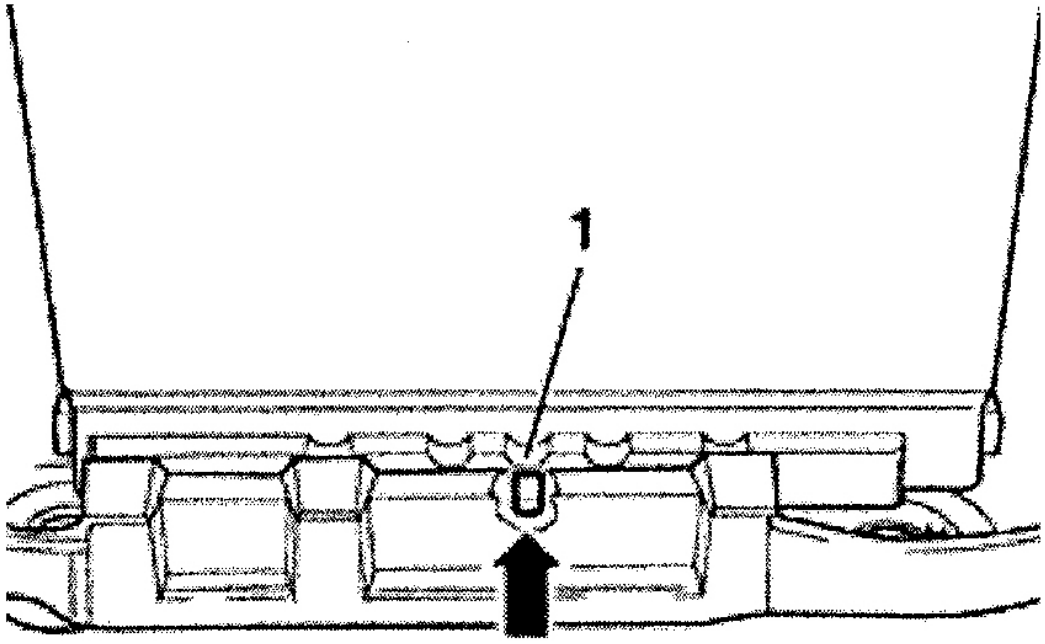

Fig. 10: Installing Battery (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

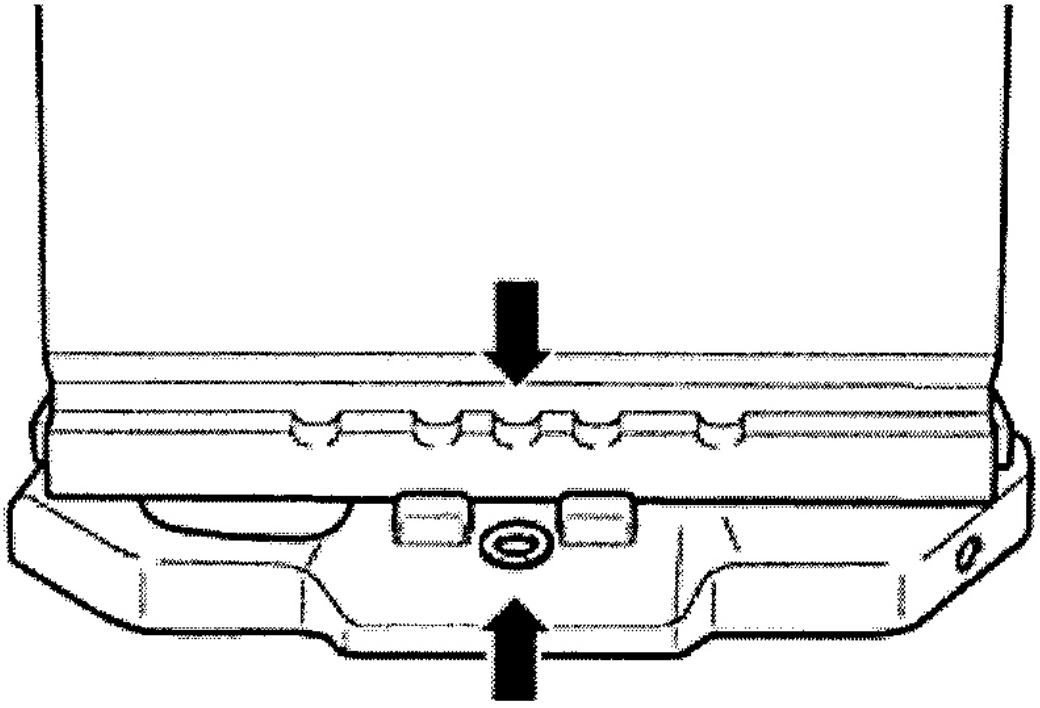

Fig. 11: Installing Battery (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removal & Installation (Sedan - Up To May 1999)

1. Disconnect battery terminals. Where applicable, the battery insulation enclosure can only be opened and removed after loosening positive clamp, and removing battery positive terminal.
2. Remove bolt (arrow). See **Fig. 12** . Remove battery hold-down. Carefully slide battery to left, and lift from battery tray.
3. To install, only use batteries with a 10.5 mm battery foot strip. Install battery so lug of battery carrier (arrow) engages in battery groove (1). See **Fig. 10** . Ensure battery can not move left or right when in position.
4. **NOTE: The battery is correctly installed when the center groove in the battery foot strip aligns with threaded hole in the battery carrier (arrows). See Fig. 11 .**

   On batteries with hose for central venting, ensure venting hose is not kinked. Battery cannot vent freely unless free of kinks. On batteries without hose for central venting, ensure opening on upper side of battery cover is not blocked.

5. Install battery hold-down and bolt (arrow). See **Fig. 12** . Tighten bolt to specification. See **TORQUE SPECIFICATIONS** . Reconnect battery terminals.

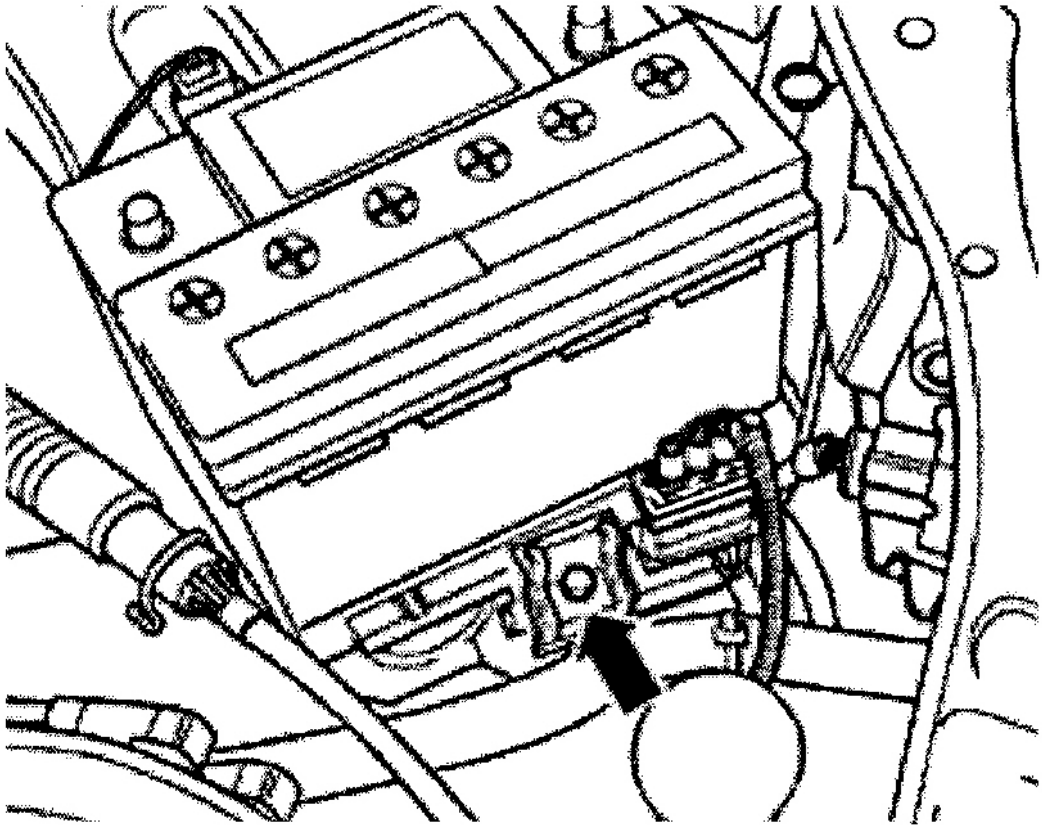

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Fig. 12: Installing Battery Hold-Down Bolt
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removal & Installation (Sedan From May 1999-Nov. 2002)

1. Disconnect battery terminals. Remove bolts (1 and 2). See **Fig. 13** . Without disconnecting lines, move power steering fluid reservoir to side
2. Remove bolt (3) and battery hold-down. Carefully slide battery with insulation enclosure (A) to left, and lift from battery tray.
3. To install, only use batteries with a 10.5 mm battery foot strip. Install battery so lug of battery carrier (arrow) engages in battery groove (1). See **Fig. 10** . Ensure battery can not move left or right when in position.
4.

NOTE: The battery is correctly installed when the center groove in the battery foot strip aligns with threaded hole in the battery carrier (arrows). See Fig. 11 .

On batteries with hose for central venting, ensure venting hose is not kinked. Only then can battery vent freely. On batteries without hose for central venting, ensure opening on upper side of battery cover is not blocked.

5. Install battery hold-down and bolt (3). See **Fig. 13** . Tighten bolt to specification. See **TORQUE SPECIFICATIONS** . Reinstall power steering fluid reservoir and bolts (3 and 4). Reconnect battery terminals.

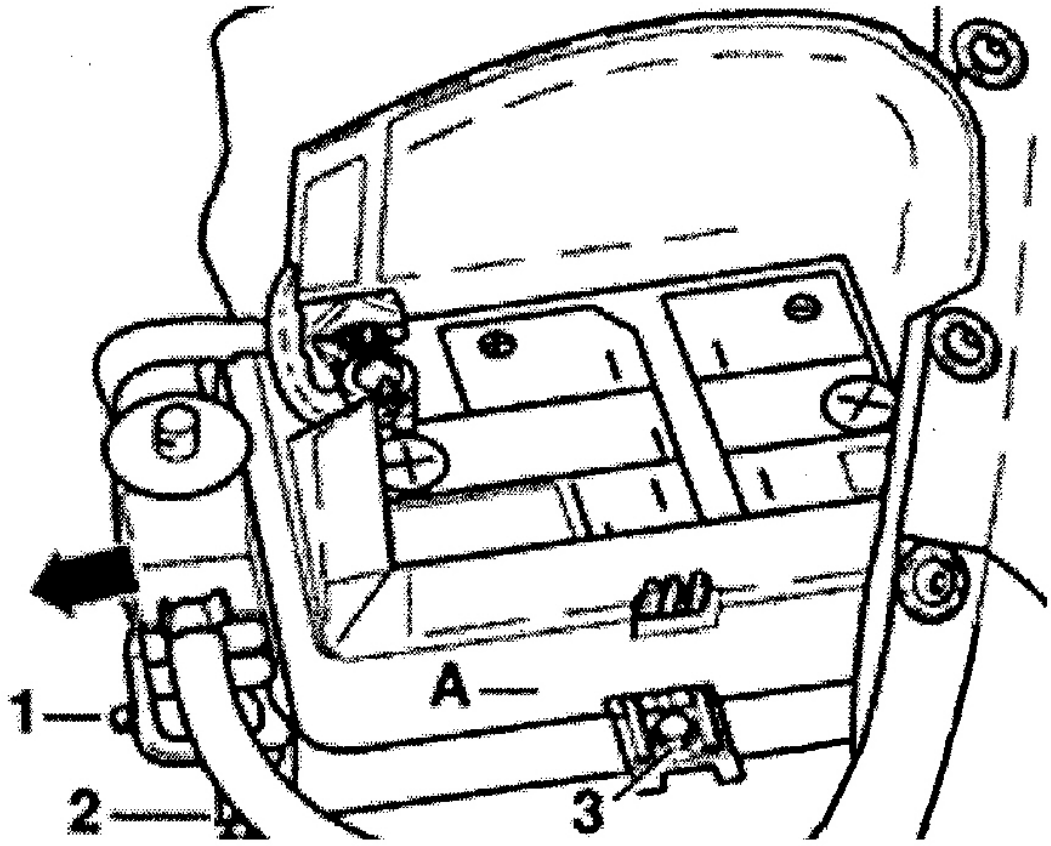

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Fig. 13: Removing Battery (Sedan May 1999-Nov. 2002)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

GENERATOR

CAUTION: Always replace ribbed belt if found to be faulty. This will avoid related

break-downs or operating problems.

CAUTION: If a used ribbed belt is to be reused, mark direction of rotation before removing. When installing used ribbed belts observe the direction of rotation marked on removal. Installing opposite to the direction of rotation leads to belt damage.

Removal & Installation (1.8L & 2.0L Engines)

1. Disconnect battery. Raise and support vehicle. Remove bolts (arrows) on sides of insulation panel. See **Fig. 14** . Lower and remove cover.
2. **NOTE: DO NOT reuse clips (2). See Fig. 15 . Always replace after releasing.**

   Remove bolts (1). See **Fig. 15** . Release clips (2). Pull heat shield out of retainer (3).
3. On vehicles equipped with 2.0L aspirated engine, pry out caps (arrows), and release fasteners underneath. See **Fig. 16** . Remove nut (1). Pull dipstick out. Remove engine cover.
4. On vehicles equipped with 1.8L engine, pry out cap (1), and remove nut underneath (2). See **Fig. 17** . Pull over out from retainers. Remove engine cover.
5. **NOTE: Mark direction of rotation of serpentine belt if it is to be reused.**

   On all vehicles, loosen belt by turning tensioner in direction of arrow. See **Fig. 18** . Block tensioner with special tool (3090). See **Fig. 19** . Remove belt. Remove belt tensioner.
6. Remove nut from terminal 30/B+ connection. Disconnect electrical connector (2). See **Fig. 20** . Remove harness retainer (3). Remove M8 hex bolts connecting generator to bracket. Lift generator out from engine compartment.
7. To install, reverse removal procedure. Where applicable, drive threaded sleeves (A) approximately 4 mm in direction of arrow. See **Fig. 21** . Tighten all generator bolts to specification. See **TORQUE SPECIFICATIONS** .
8. Ensure all assemblies are securely mounted and turn freely. For aid in belt routing, see **Fig. 1** . Counter-hold tensioner, and remove special tool (3090). Slowly release tensioner to engage ribbed belt.
9. Start engine, and check belt running. To complete installation, reverse removal procedure.

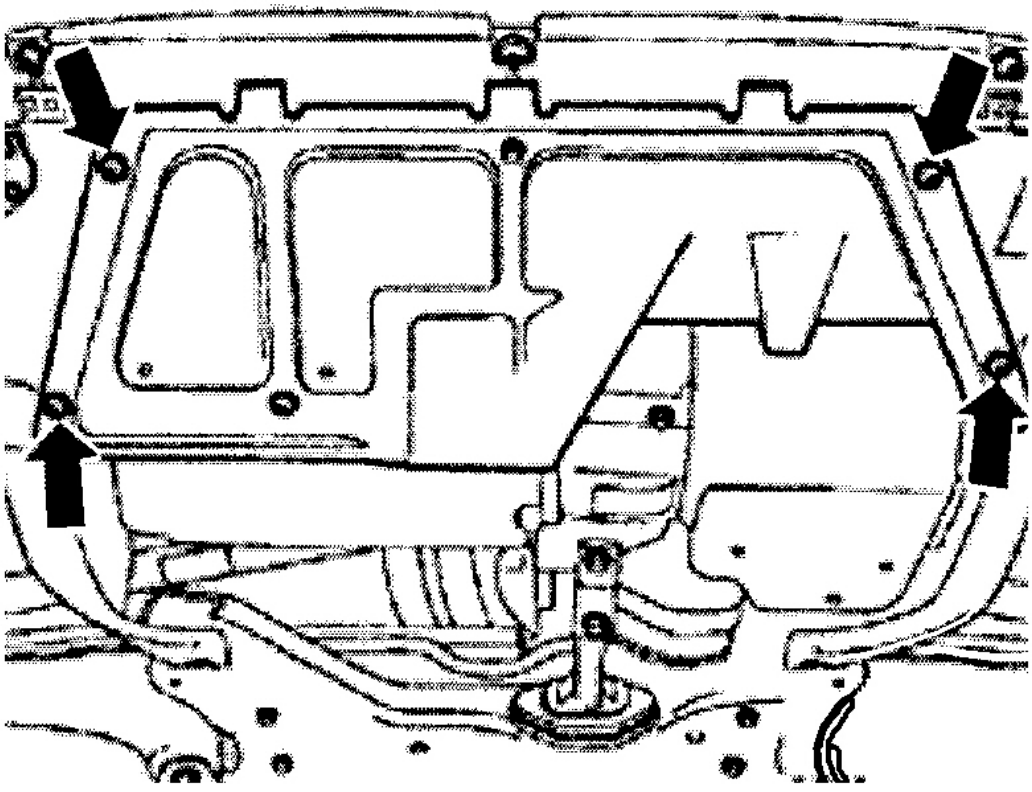

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Fig. 14: Locating Insulation Panel Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

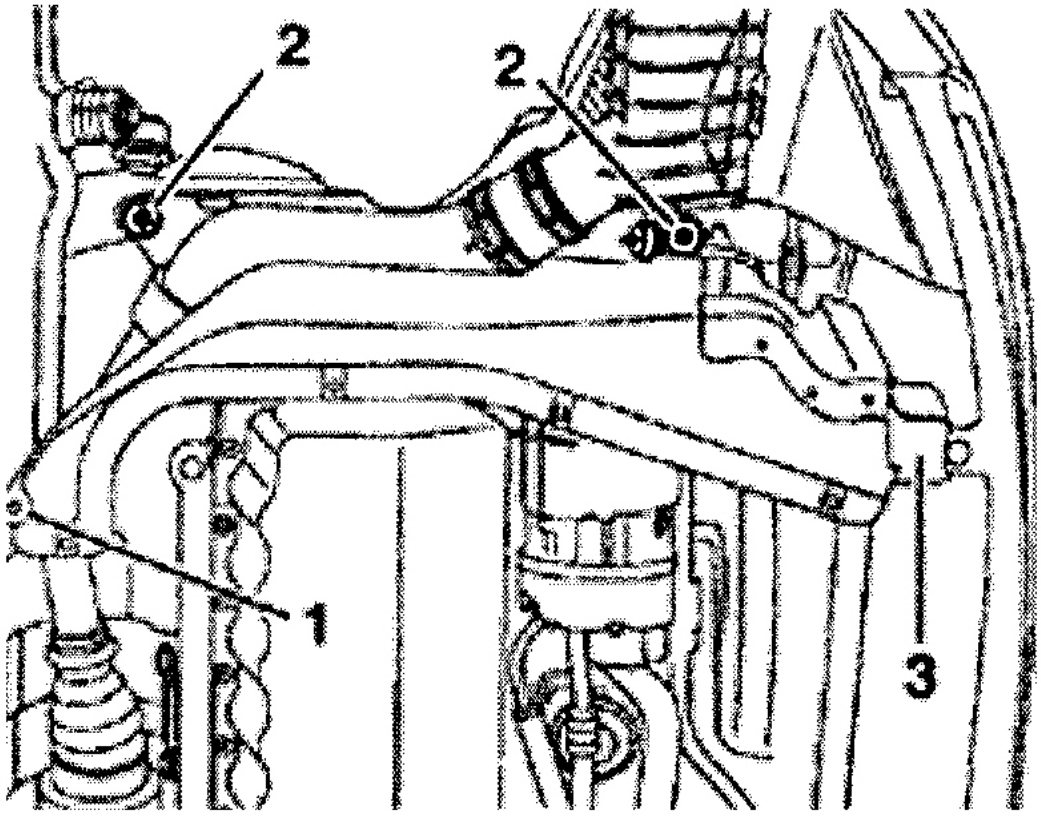

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Fig. 15: Locating Heat Shield Bolts & Clips
Courtesy of VOLKSWAGEN UNITED STATES, INC.

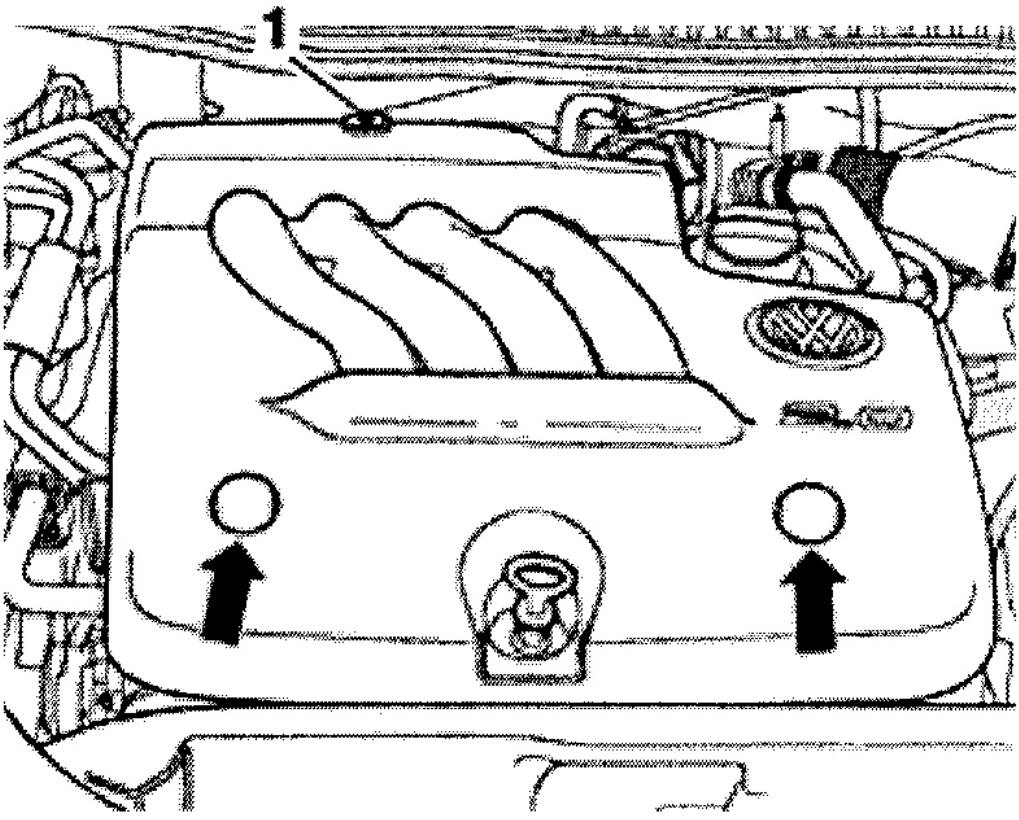

Fig. 16: Removing Engine Cover (2.0L Engine)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

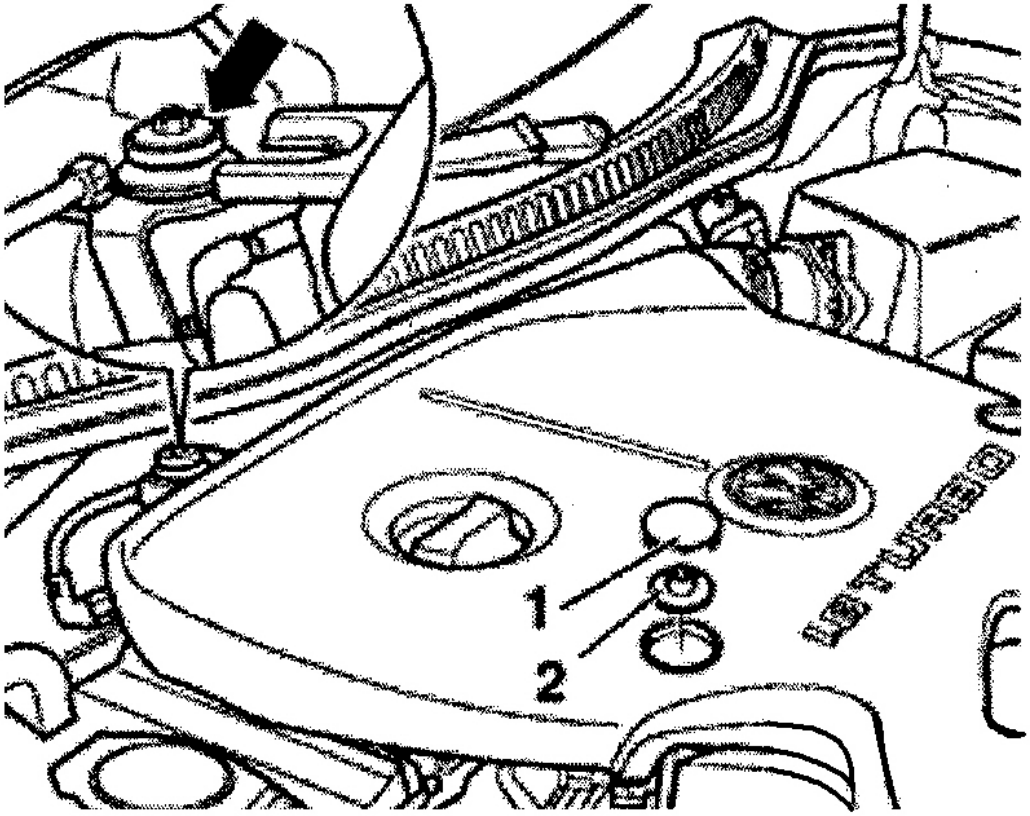

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Fig. 17: Removing Engine Cover (1.8L Turbo)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

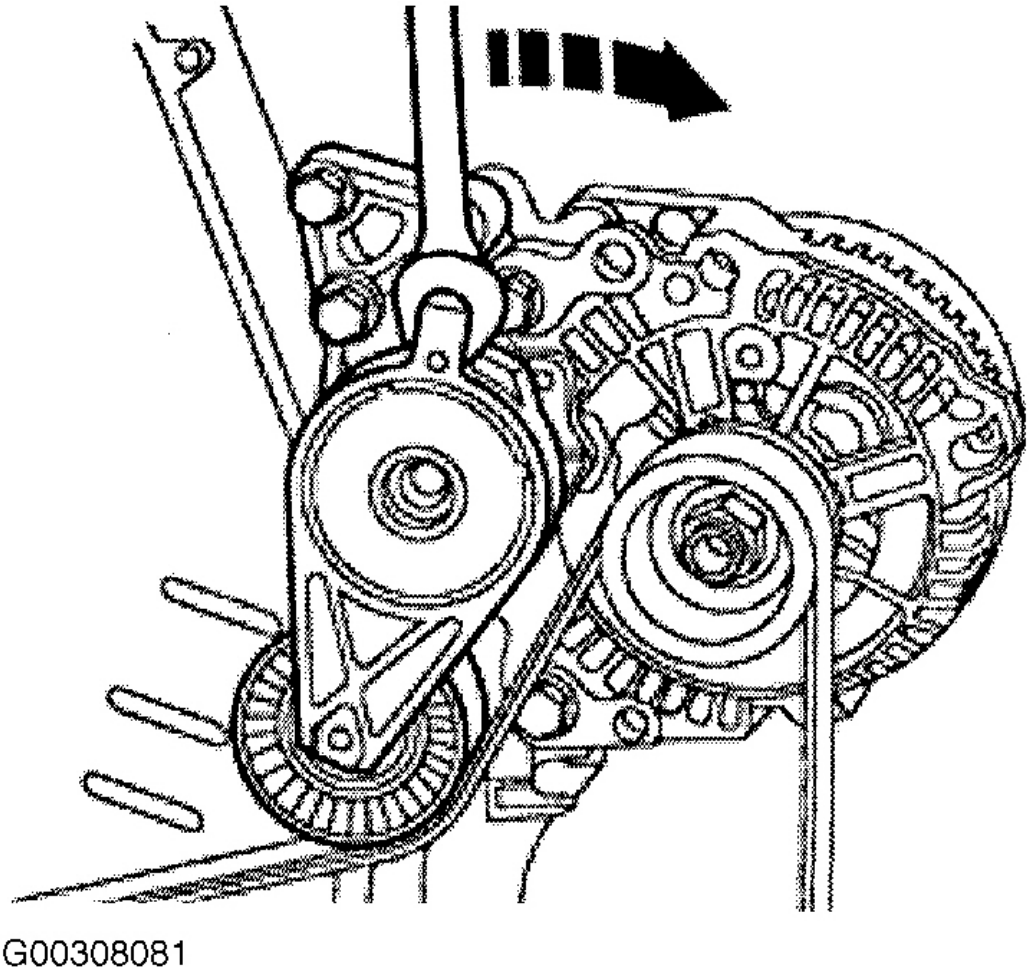

Fig. 18: Loosening Serpentine Belt (1.8L, 1.9 L TDI-PD & 2.0L)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

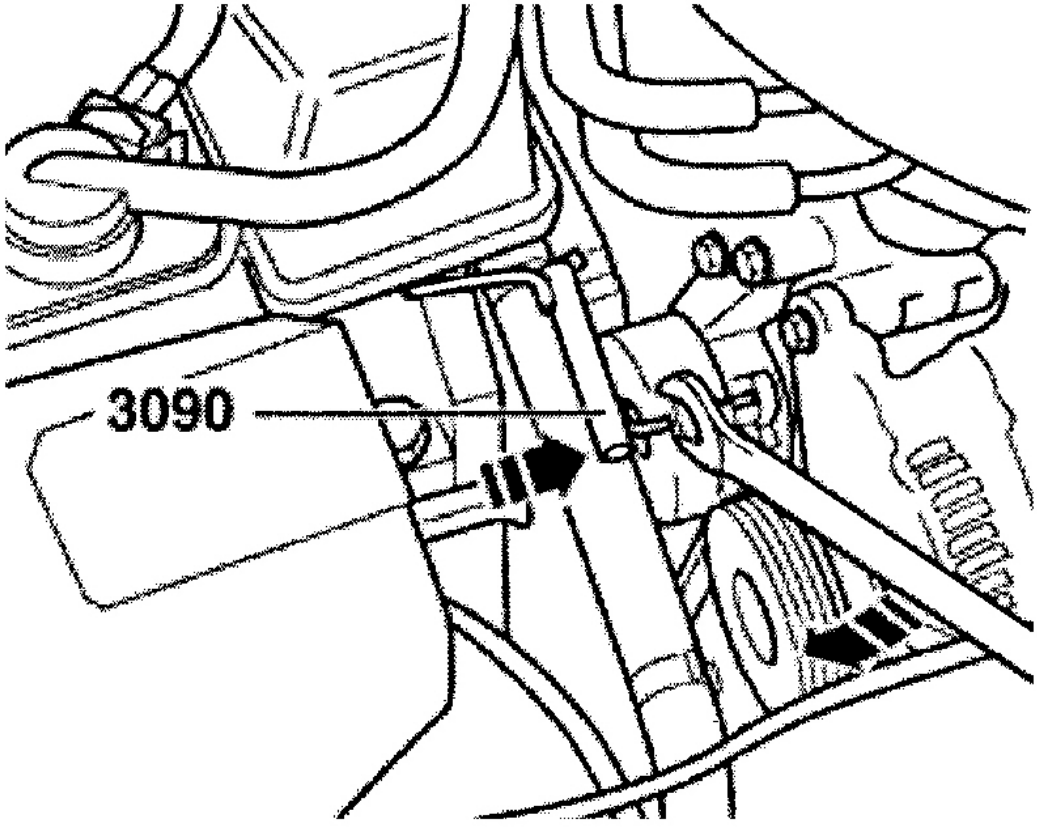

Fig. 19: Blocking Tensioner W/Special Tool (3090)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

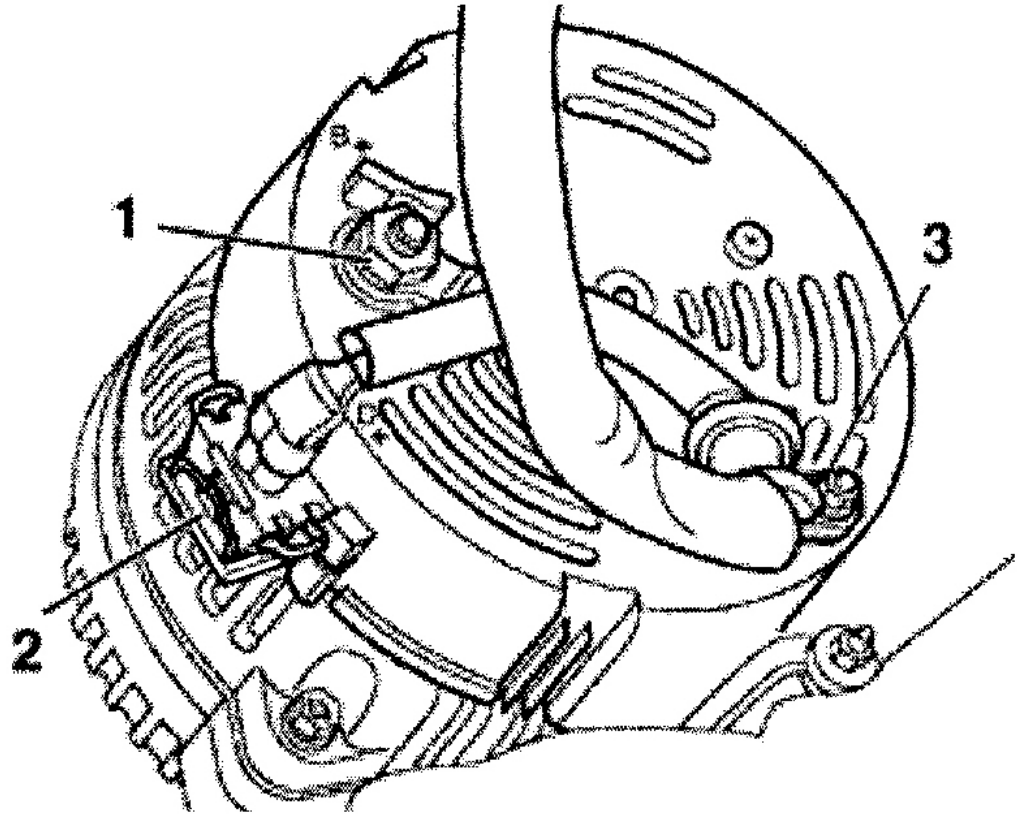

Fig. 20: Removing Generator (1.8L)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

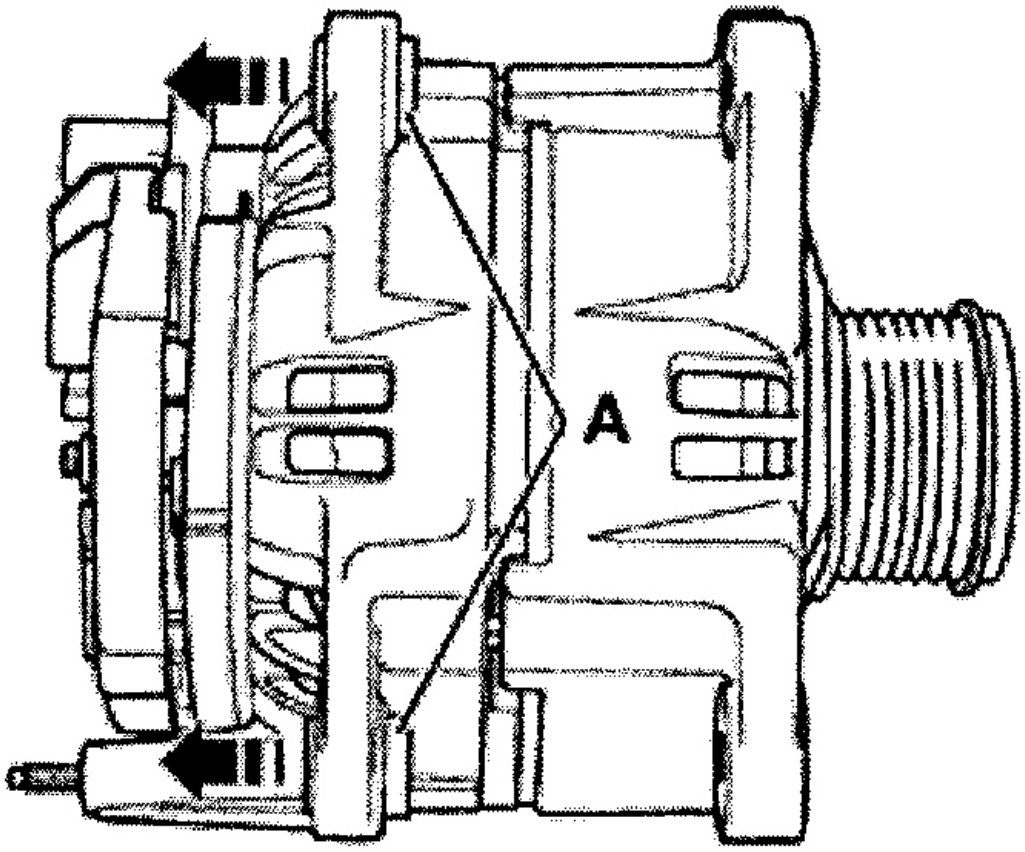

Fig. 21: Driving Threaded Sleeves In Generator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removal & Installation (1.9L TDI & TDI-PD)

1. Disconnect battery. Raise and support vehicle. Remove bolts (arrows) on sides of insulation panel. See **Fig. 14** . Lower and remove cover.
2. **NOTE: DO NOT reuse clips (2). See Fig. 15 . Always replace after releasing.**

   Remove bolts (1). See **Fig. 15** . Release clips (2). Pull heat shield out of retainer (3).
3. On vehicle equipped with 1.9L TDI engine, pry out caps (arrows), and release fasteners underneath. See **Fig. 22** . Remove nut (1). Pull oil dipstick out. Remove engine cover. Remove charge air pipe between charge air cooler and exhaust turbocharger. See **Fig. 23** . Turning tensioner in direction of arrow, loosen tensioner. See **Fig. 24** .

4. On vehicles equipped with 1.9L TDI-PD engine, carefully pull front of engine cover upward (arrow "A"), and pull forward out of retainers (Arrow "B"). See **Fig. 25** . Pull oil dipstick out. Remove engine cover. Remove charge air pipe between charge air cooler and exhaust turbocharger. See **Fig. 26** . Turning tensioner in direction of arrow, loosen tensioner. See **Fig. 18** .
5. **CAUTION: Mark direction of rotation of serpentine belt, if it is to be reused.**

   On all vehicles, use special tool (3090) to block tensioner. Remove belt from idler. Remove belt from other components. Move lock carrier into service position. See **LOCK CARRIER** .
6. Remove nut from terminal 30/B+ connection. Disconnect electrical connector (2). See **Fig. 20** . Remove harness retainer (3). Remove M8 hex bolts connecting generator to bracket. Lift generator out from engine compartment.
7. To install, reverse removal procedure. Where applicable, drive threaded sleeves (A) approximately 4 mm in direction of arrow. See **Fig. 21** . Tighten all generator bolts to specification. See **TORQUE SPECIFICATIONS** .
8. Ensure all assemblies are suecurely mounted and turn freely. For aid in belt routing, see **Fig. 2** . Counter-hold tensioner, and remove special tool (3090). Slowly release tensioner to engage ribbed belt.
9. Install charge air pipe between charge air cooler and exhaust turbocharger. See **Fig. 23** or **Fig. 26** . Tighten bolt to specification. See **TORQUE SPECIFICATIONS** . Start engine and check belt running. To complete installation, reverse removal procedure.

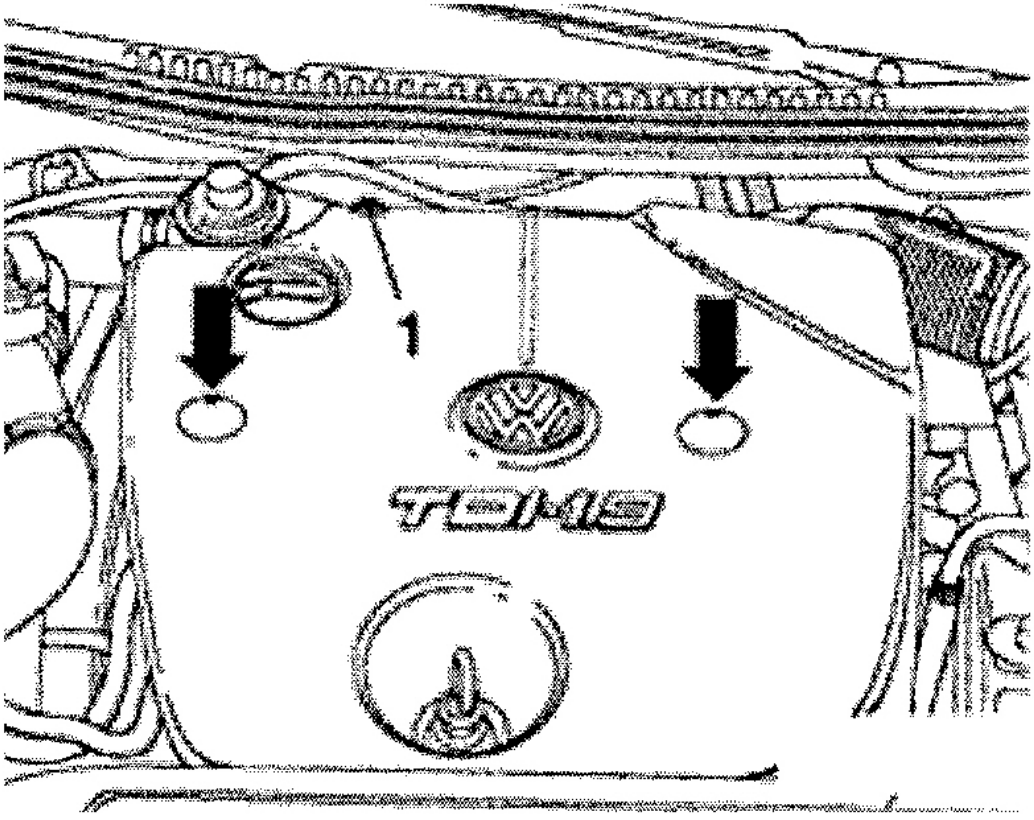

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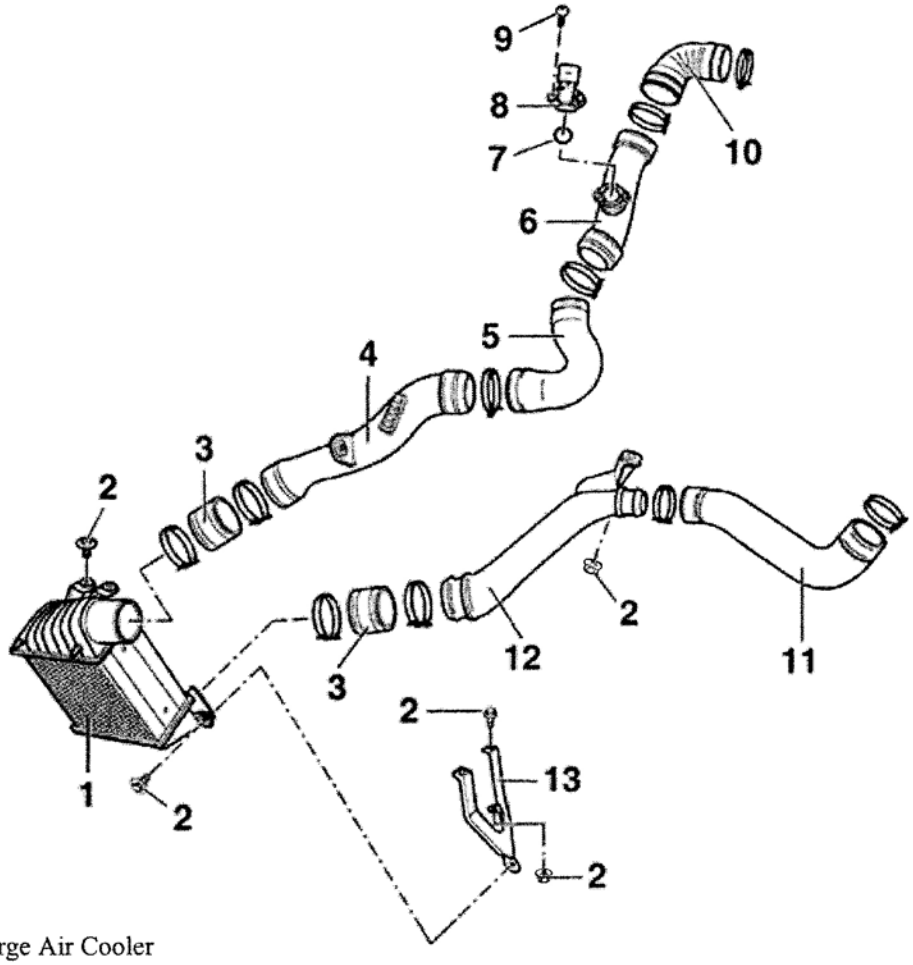
Fig. 22: Removing Engine Cover (1.9L TDI)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



1. Charge Air Cooler
2. Bolt
3. Connecting Hose
4. Connecting Pipe (Charge Air Cooler-To-Intake Manifold Lower Pipe)
5. Connecting Hose
6. Connecting Pipe (Charge Air Cooler-To-Intake Manifold Upper Pipe)
7. O-Ring (Replace If Damaged)
8. Intake Air Temperature Sensor -G72-
9. Bolt
10. Connecting Hose (Charge Air Cooler-To-Intake Manifold)
11. Connecting Hose (Charge Air Cooler-To-Turbocharger)
12. Charge Air Cooler
13. Bracket

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Fig. 23: Exploded View Of Charge Air Cooler (1.9L TDI)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

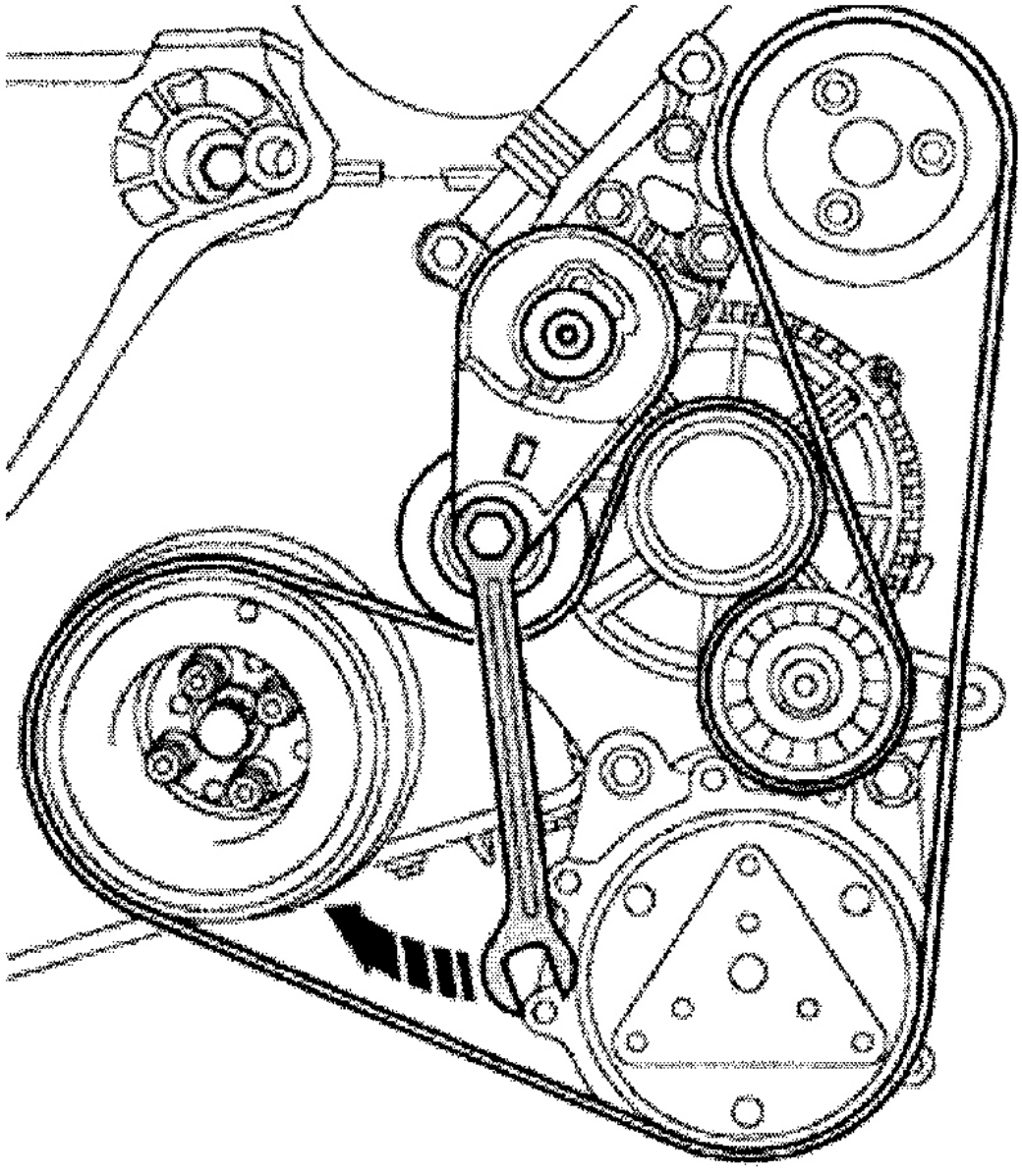

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Fig. 24: Loosening Serpentine Belt (1.9L - TDI)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

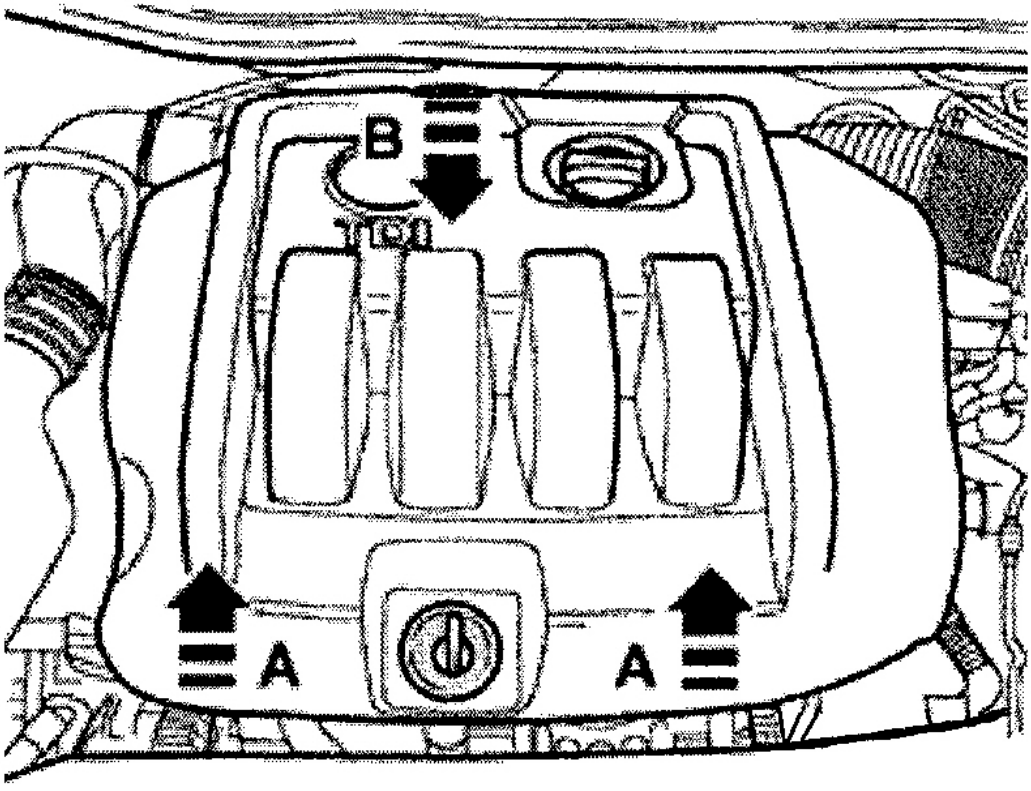

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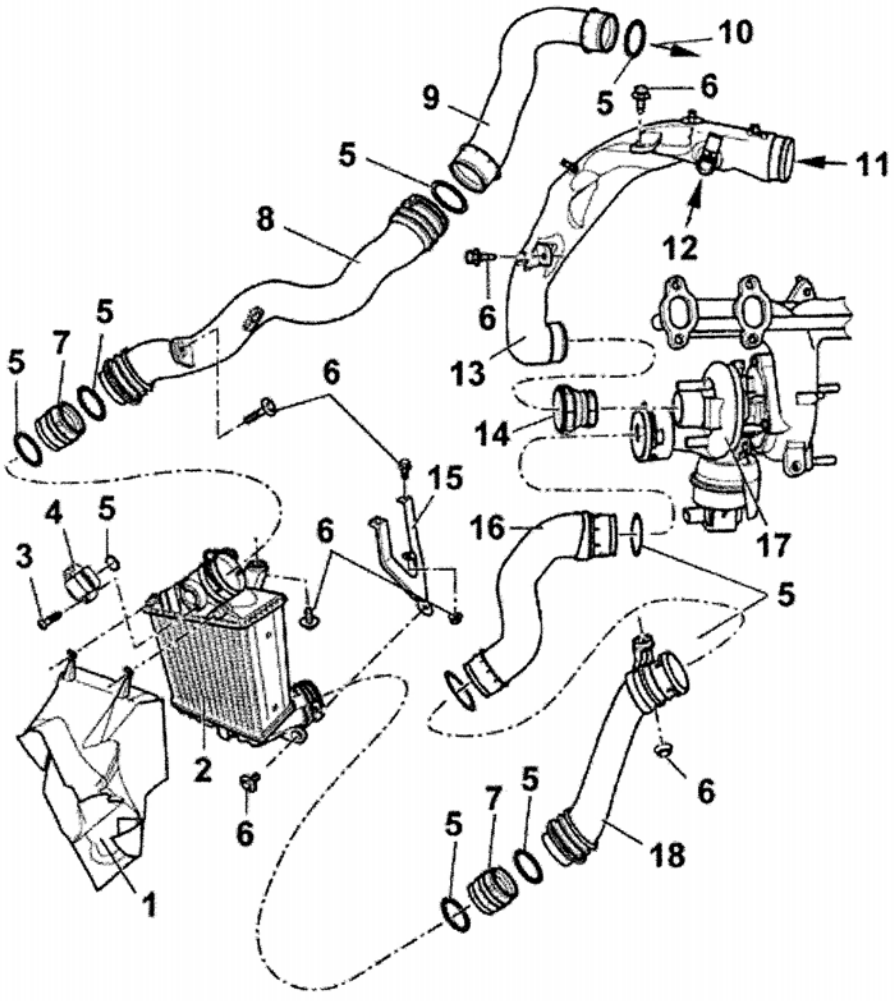
Fig. 25: Removing Engine Cover (1.9L TDI-PD)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



1. Air Duct
2. Charge Air Cooler
3. Bolt
4. Manifold Absolute Pressure Sensor
5. O-Ring (Replace If Damaged)
6. Bolt
7. Tube Connection Piece
8. Upper Charge Air Pipe
9. Connecting Hose (Upper Charge Air Pipe-To-Intake Manifold Flap)
10. To Intake Manifold Flap
11. From Air Cleaner
12. From Crankcase Ventilation-To-Cylinder Head Cover
13. Rear Charge Air Line
14. Connecting Hose (Rear Charge Air Pipe-To-Exhaust Turbocharger)
15. Bracket
16. Connecting Hose (Exhaust Turbocharger-To-Lower Charge Air Line)
17. Turbocharger
18. Lower Charge Air Pipe

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Fig. 26: Exploded View Of Charge Air Cooler (1.9L TDI-PD)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

GENERATOR BELT PULLEY

Removal & Installation (W/Freewheel)

NOTE: Freewheel pulley can be retrofitted in vehicles with a Bosch generator. Freewheel pulley cannot be retrofitted in vehicles with Valeo generator. Valeo generators must be replaced for Bosch generator.

1. Release socket drive (1), and pull off grip (2). See **Fig. 27** . Turn torque wrench grip 180°. Reinsert socket drive. Set wrench direction of turn on socket drive to clockwise.
2. Remove protective cap from pulley. Place 6 mm hex bit socket into generator shaft. Counter-hold multi-point socket (3400) with 17 mm box wrench. See **Fig. 28** .
3. Insert torque wrench into hex bit socket. Loosen freewheel pulley by turning generator shaft clockwise. Remove freewheel pulley once loosened.
4. To install freewheel pulley, insert multi-point socket (3400) in freewheel pulley. Tighten pulley by hand onto generator drive shaft until stop.
5. Ensure wrench grip is turned 180°, as stated in step 1 . Set wrench direction on socket drive to counter-clockwise. Set torque wrench tightening torque to 59 ft. lbs. (80 N.m). Place 6 mm hex bit socket into generator shaft.
6. Counter-hold multi-point socket (3400) with 17 mm box wrench. Using torque wrench, turn generator drive shaft counter-clockwise, and tighten freewheel pulley to specification. See **TORQUE SPECIFICATIONS** . Clip protective cap onto freewheel pulley.

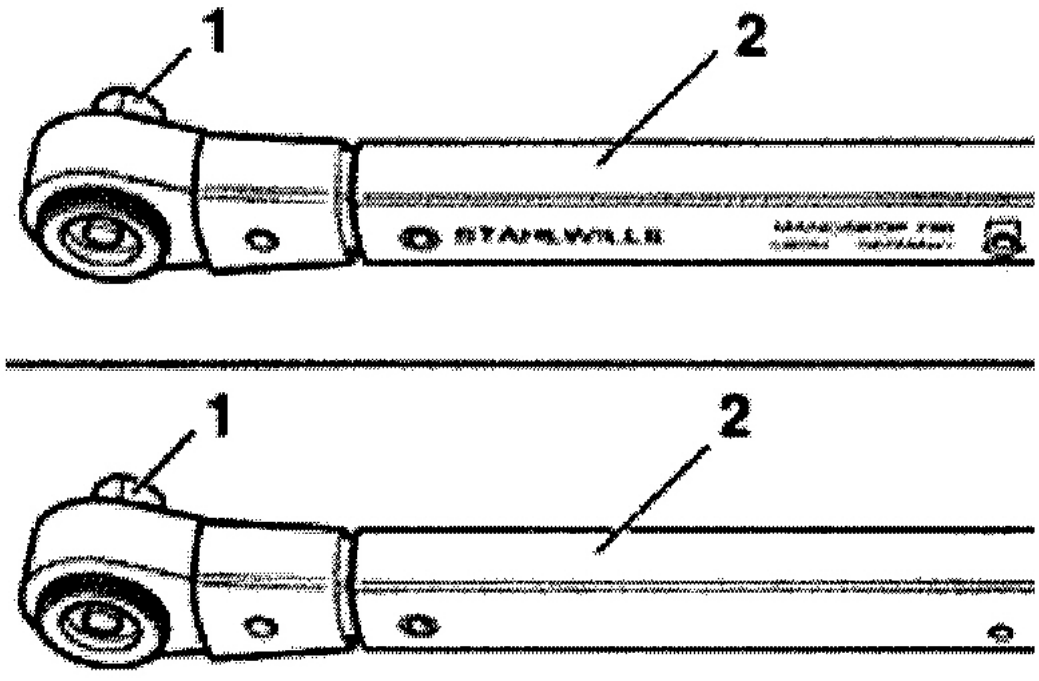

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Fig. 27: Turning Torque Wrench Grip
Courtesy of VOLKSWAGEN UNITED STATES, INC.

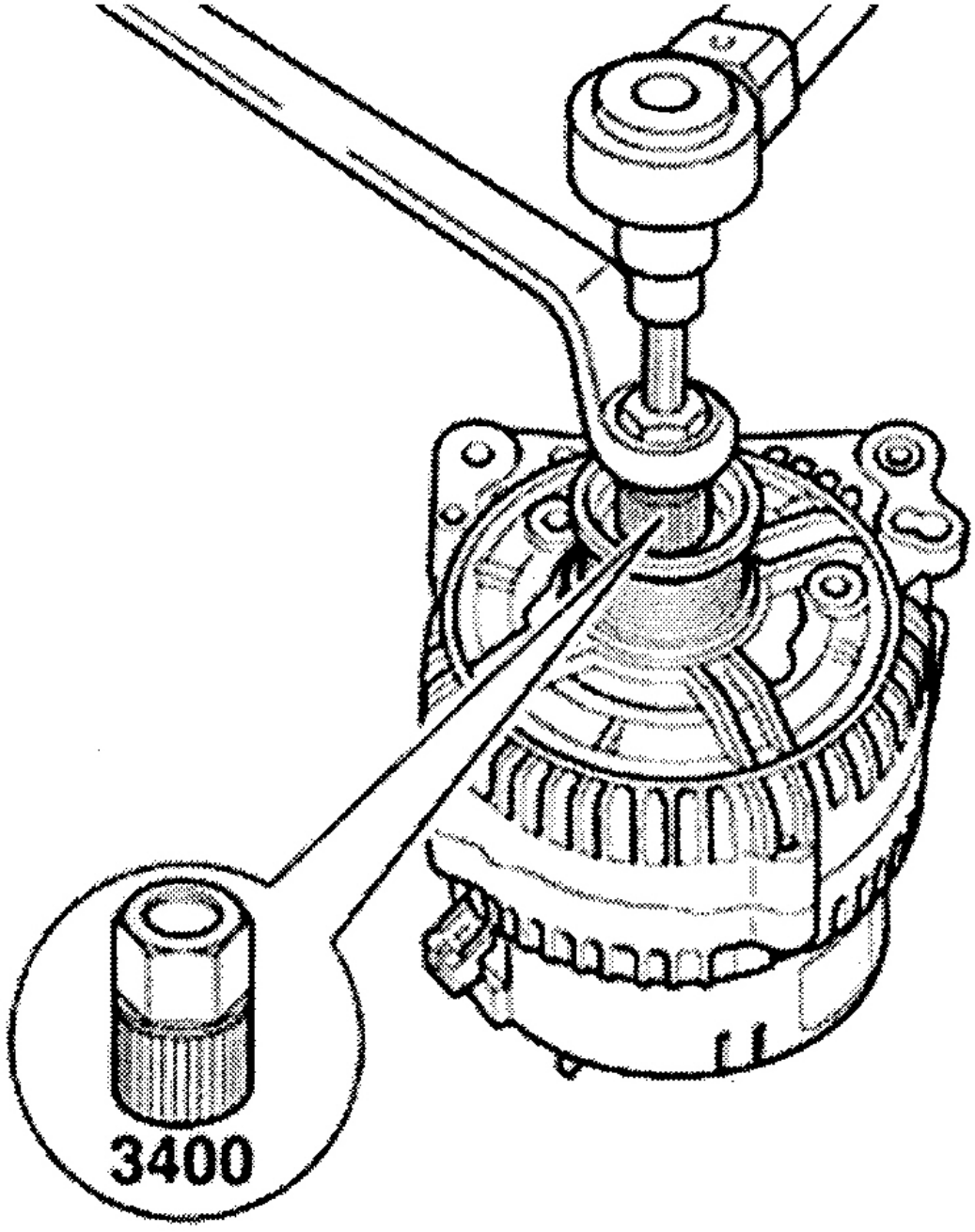

Fig. 28: Installing Freewheel Hub-To-Generator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removal & Installation (W/O Freewheel)

Use multi-point socket (3310) to loosen and tighten serpentine belt pulley. See **Fig. 29** . Tighten pulley nut to specification. See **TORQUE SPECIFICATIONS** .

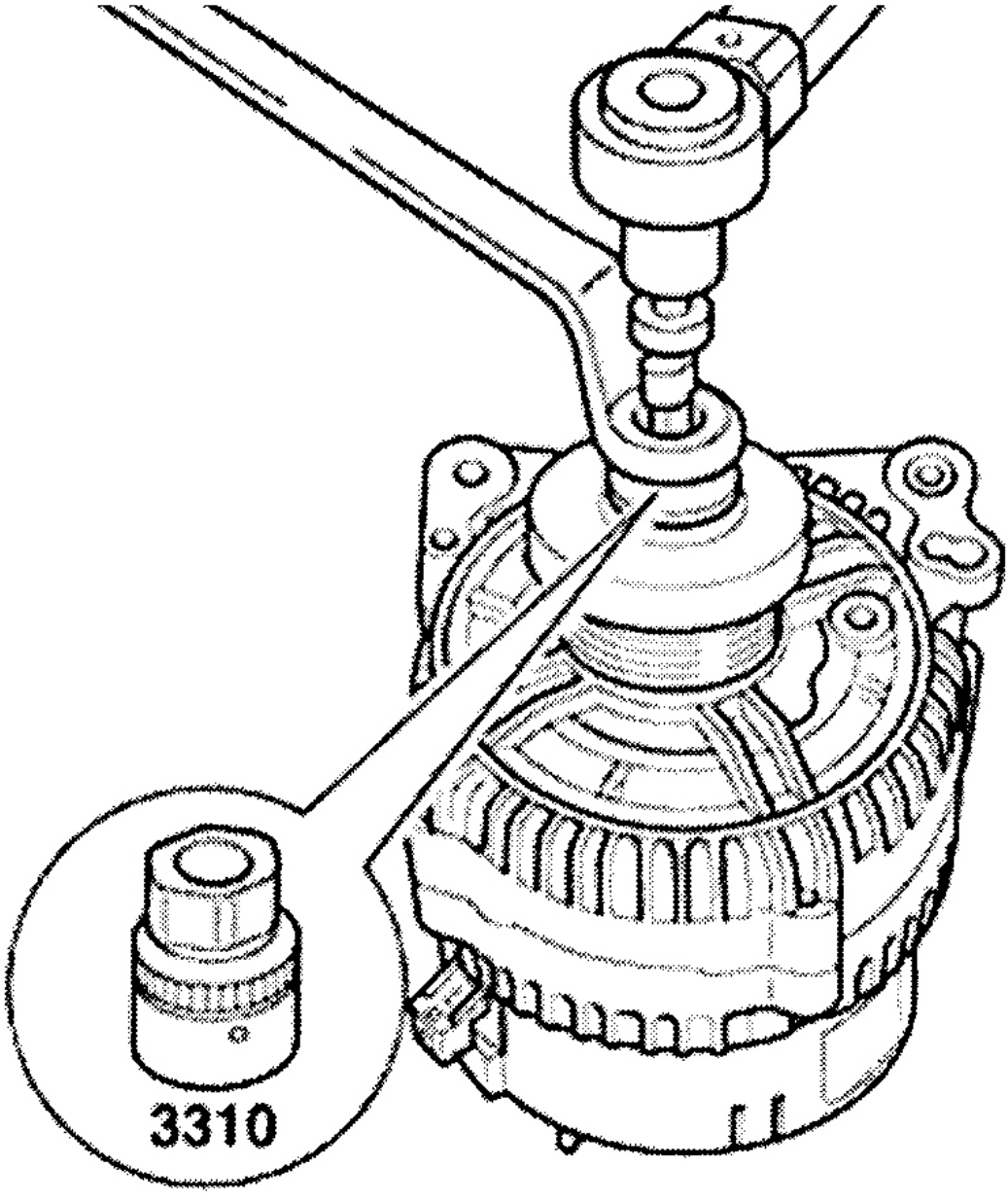

Fig. 29: Removing & Installing Serpentine Belt Pulley
Courtesy of VOLKSWAGEN UNITED STATES, INC.

LOCK CARRIER

1. Remove center undercar tray. Drain coolant from radiator. Remove front inner fenders. Remove fender

bolts from inside of fender. See **Fig. 30** . Remove lower fender bolts. Remove screws from rear of fender. Remove 3 screws from under front of bumper cover. Remove 16 screws under hood attaching fenders and bumper cover to vehicle. With the aid of a helper, remove front fenders and bumper cover as an assembly.

2. Disconnect hood latch cable. Remove upper bumper bolt on each side and install Special Tools (3411). See **Fig. 31** and **Fig. 32** . Remove upper panel bolts and remaining bumper bolts. Slide entire lock carrier assembly out on special tools.
3. Disconnect radiator hoses. Disconnect radiator mounted switch harness connectors. Remove radiator mounting bolts. See **Fig. 33** . On vehicles equipped with A/C, remove A/C line retaining clamps. DO NOT disconnect hoses. Fasten condenser to lock carrier before removing radiator. On all vehicles, remove radiator. To install, reverse removal procedure. Fill cooling system. Adjust headlights as necessary.

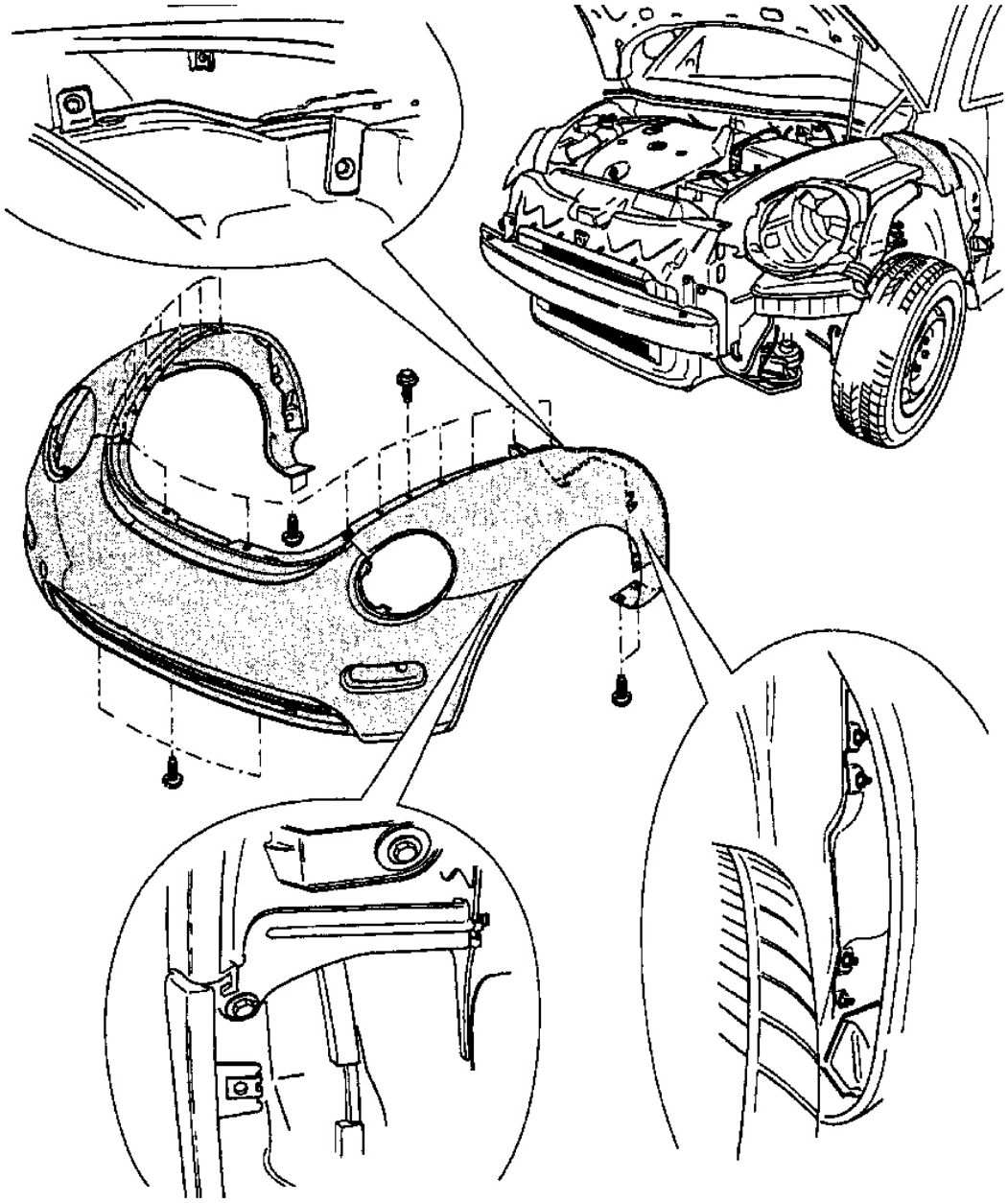

Fig. 30: Removing Front Fenders & Bumper Cover
Courtesy of VOLKSWAGEN UNITED STATES, INC.

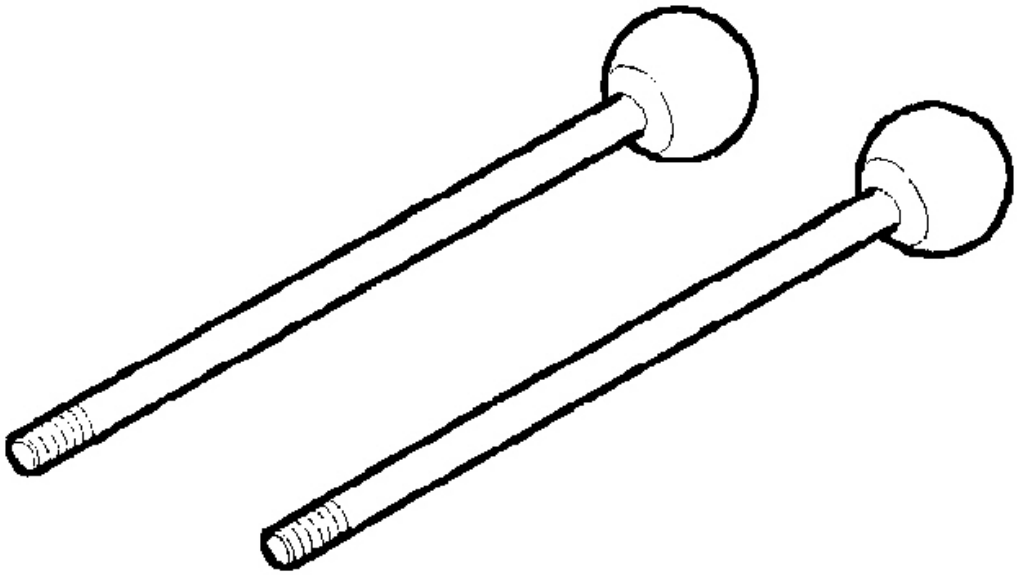

Fig. 31: Identifying Guide Rods (Part No. 3411)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

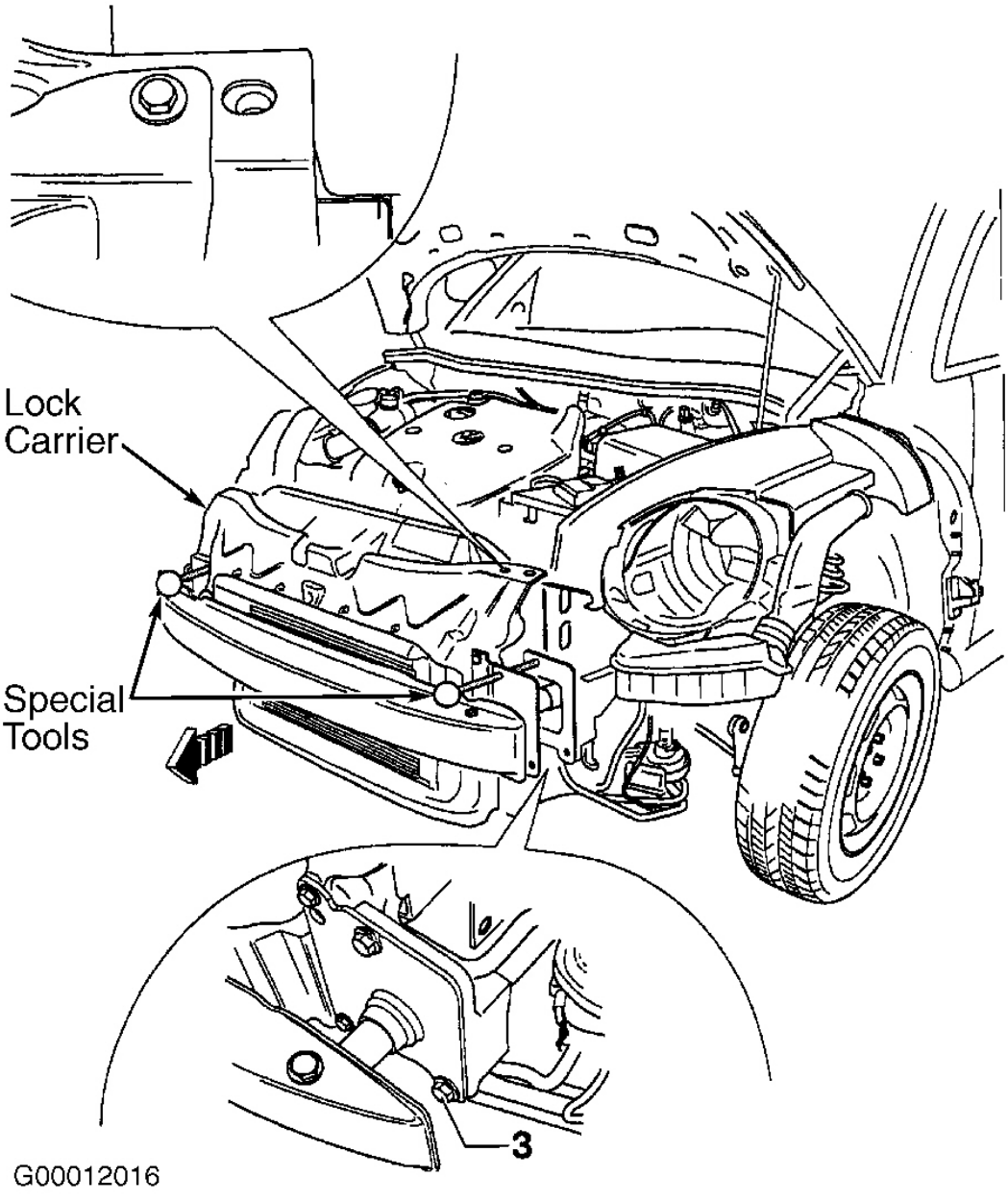

Fig. 32: Sliding Out Lock Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

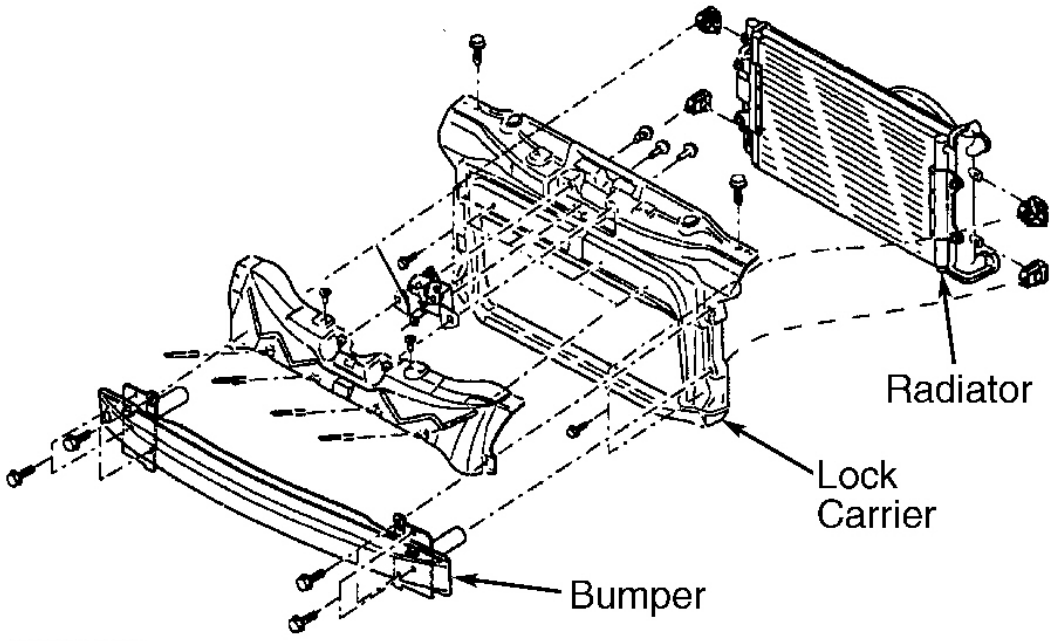

Fig. 33: Exploded View Of Lock Carrier
Courtesy of VOLKSWAGEN UNITED STATES, INC.

VOLTAGE REGULATOR

NOTE: On vehicles built up to May 1999 voltage regulators are serviceable. On vehicles built from June of 1999, voltage regulator can no longer be replaced. In contrast to previously used generators, new generators have no removable protective cap. In these generators, if the voltage regulator malfunctions, complete generator must be replaced.

Removal & Installation (Models Up To May 1999)

1. Remove generator. See appropriate procedure under **GENERATOR** .
2. Remove bolts (arrows) and protection cover. See **Fig. 34** . Remove bolts at voltage regulator. Remove voltage regulator.
3. To install, reverse removal procedure.

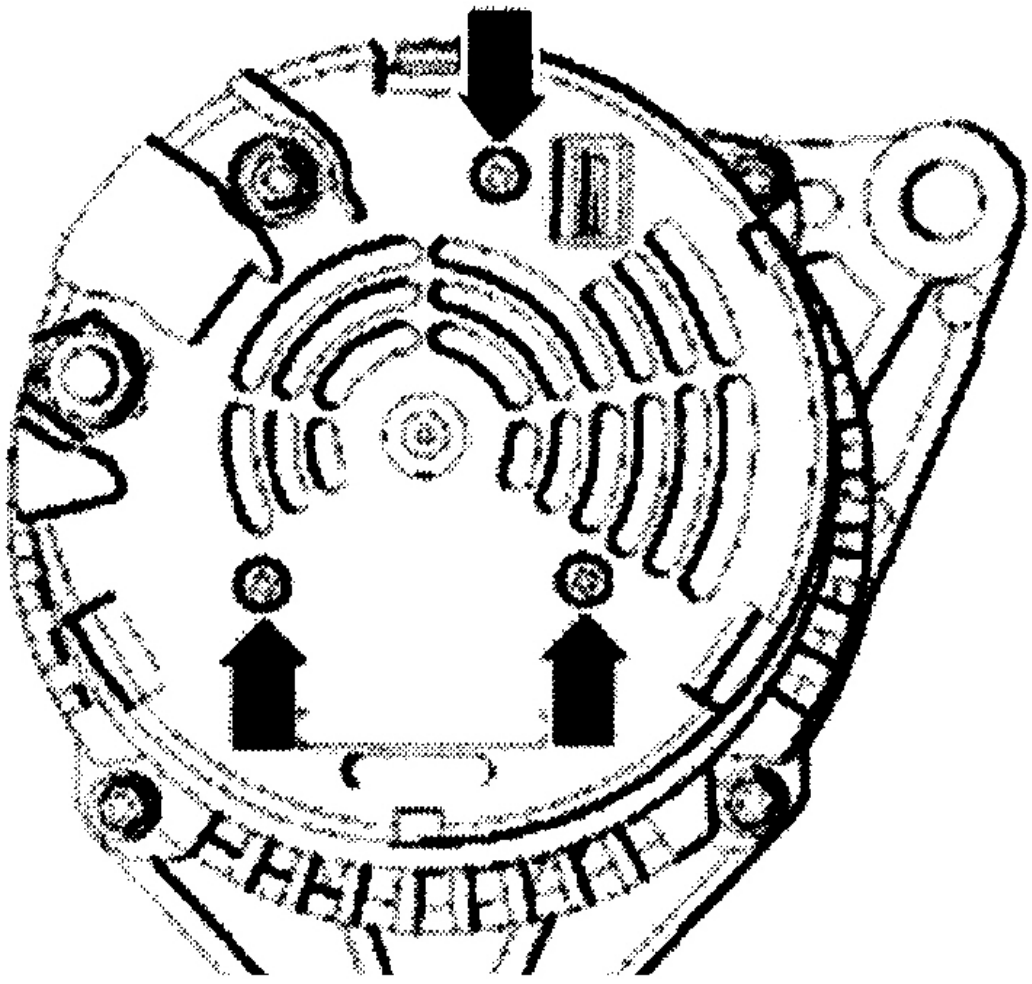

Fig. 34: Removing & Installing Generator Protective Cap (Models Up To May 1999)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removal & Installation (Models From June 1999 & On)

1. Remove generator. See appropriate procedure under **GENERATOR** .
2. Remove mounting nuts (arrows "A") from protective cap. See **Fig. 35** . Remove bolt (arrow "B") from protective cap. Remove protective cap.
3. Remove bolts (arrows). See **Fig. 36** . Remove voltage regulator.
4. To install, reverse removal procedure.

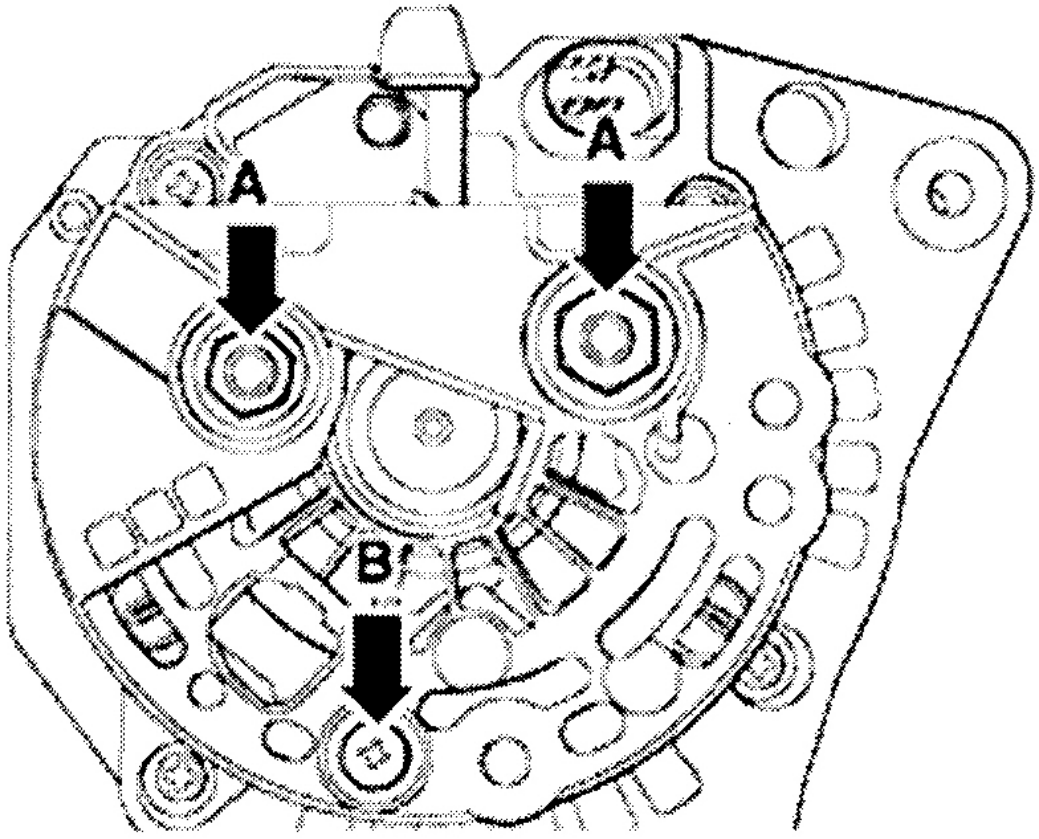

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Fig. 35: Removing Protective Cap (Models From June 1999)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

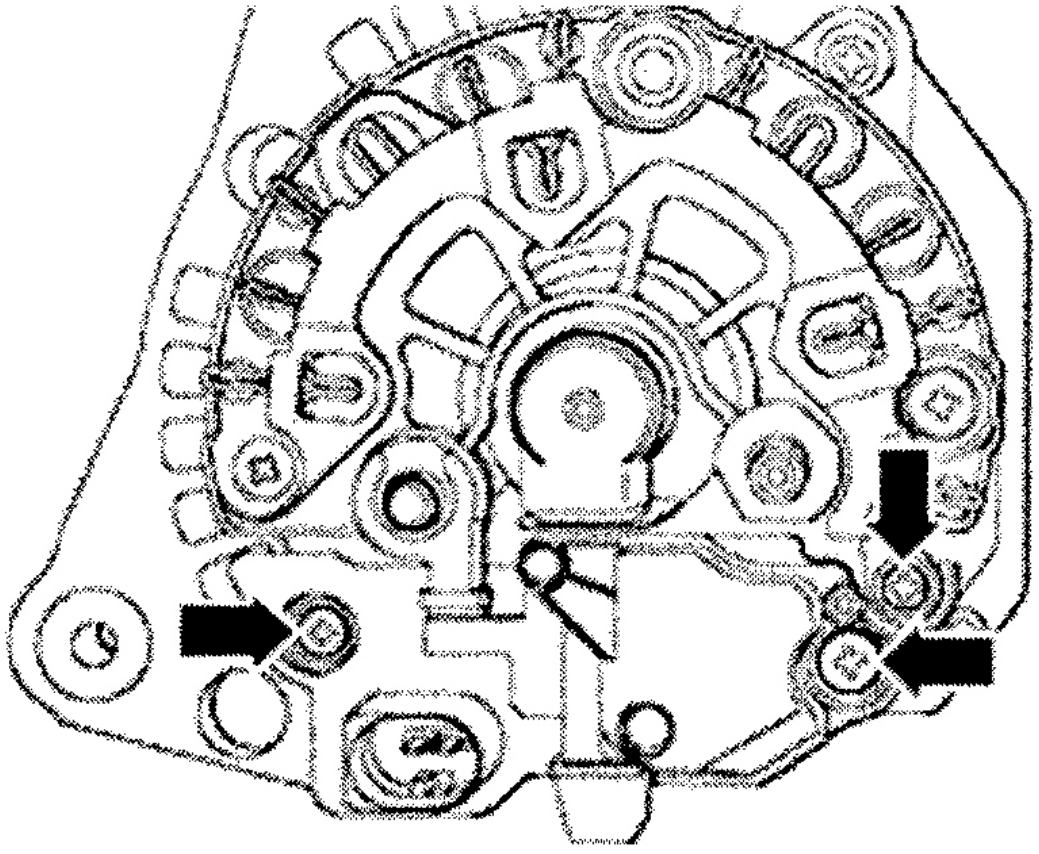


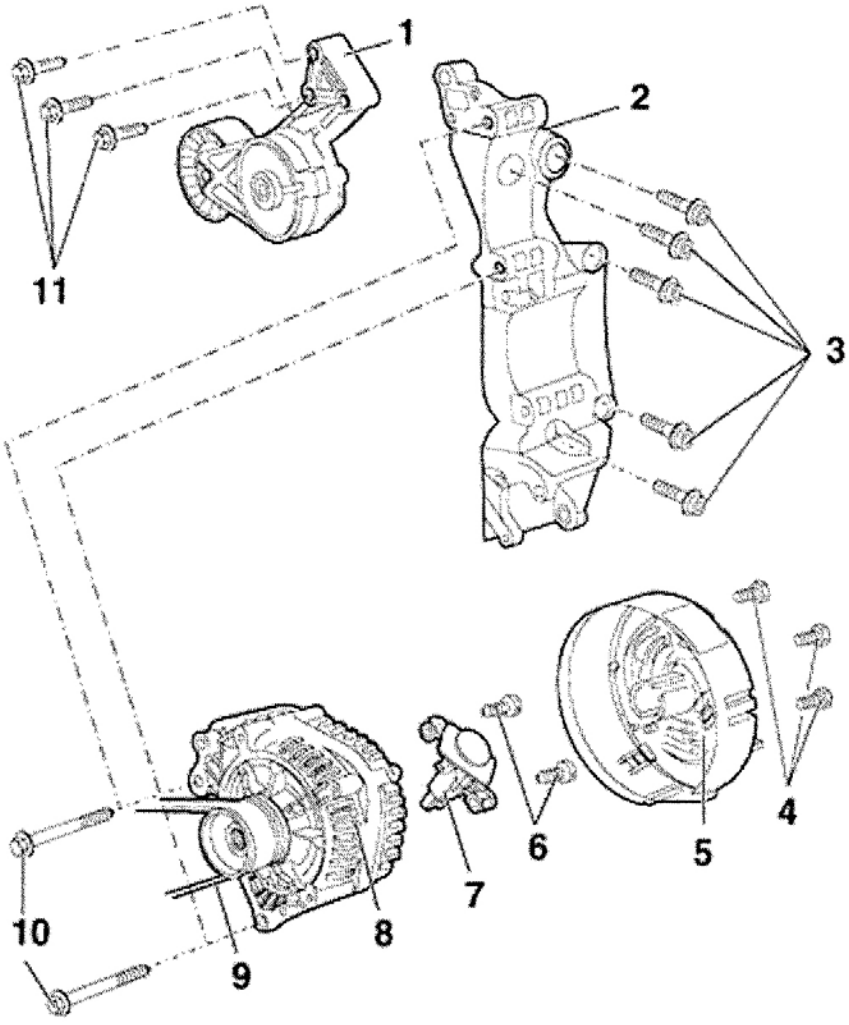
Fig. 36: Removing & Installing Voltage Regulator (Models From June 1999)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

OVERHAUL

NOTE: On vehicles built up to May 1999 voltage regulators are serviceable. On vehicles built from June of 1999, voltage regulator can no longer be replaced. In contrast to previously used generators, new generators have no removable protective cap. In these generators, if the voltage regulator malfunctions, complete generator must be replaced.

Other than replacing voltage regulator (where possible), manufacturer recommends replacing generator as an assembly. Overhaul procedures are not available. Diesel vehicles may be equipped with a generator pulley freewheeling clutch. Freewheeling clutch must be removed from old generator, and installed on new unit. Use multipoint Socket (3310) to remove and install generator pulley or freewheeling clutch. On Diesel vehicles equipped with Valeo generator, pulley cannot be refitted. Replace Valeo generator with a Bosch generator. See

Fig. 37 -**Fig. 38** .



4-CYLINDER GASOLINE ENGINES THROUGH 04.99 ASSEMBLY

1- Tensioner
2- Bracket
3- Hex socket bolts
- M10 x 45mm
- 45 Nm

4- Hex bolts
- M3 x 18mm

5- Protective cap
6- Screws
- M4 x 25mm

7- Voltage Regulator (VR)
8- Generator (GEN)
9- Ribbed belt
10- Hex bolts
- M8 x 85mm
- 25 Nm

11- Hex bolts
- M8 x 45mm
- 25 Nm

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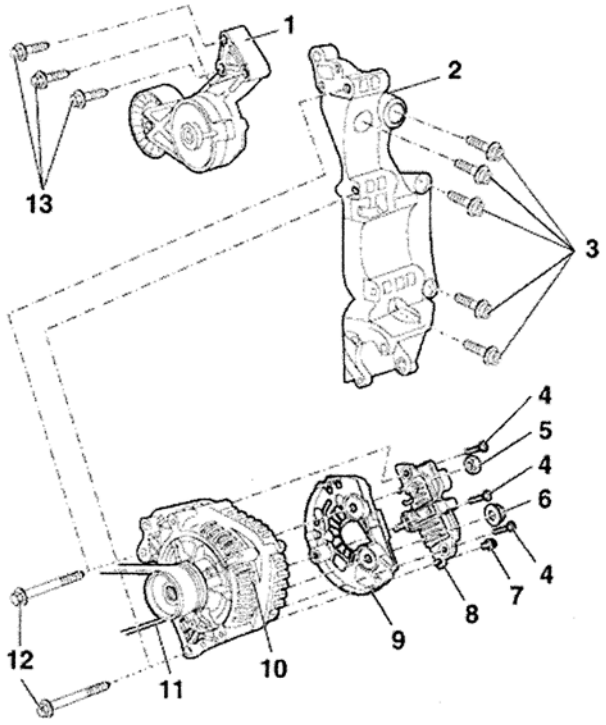
Fig. 37: Exploded View Of Generator (1.8L & 2.0L - 4-Cyl.)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



4-cylinder gasoline engines from 05.99 assembly

1 - Tensioner

2 - Bracket

3 - Hex socket bolts

- M10 x 45mm
- 45 Nm

4 - Screws

5 - Hex nut

- M8

6 - Hex nut

- M8

7 - Screw

8 - Voltage Regulator (VR)

9 - Protective cap

10 - Generator (GEN)

11 - Ribbed belt

12 - Hex bolts

- M8 x 85mm
- 25 Nm

13 - Hex bolts

- M8 x 45mm
- 25 Nm

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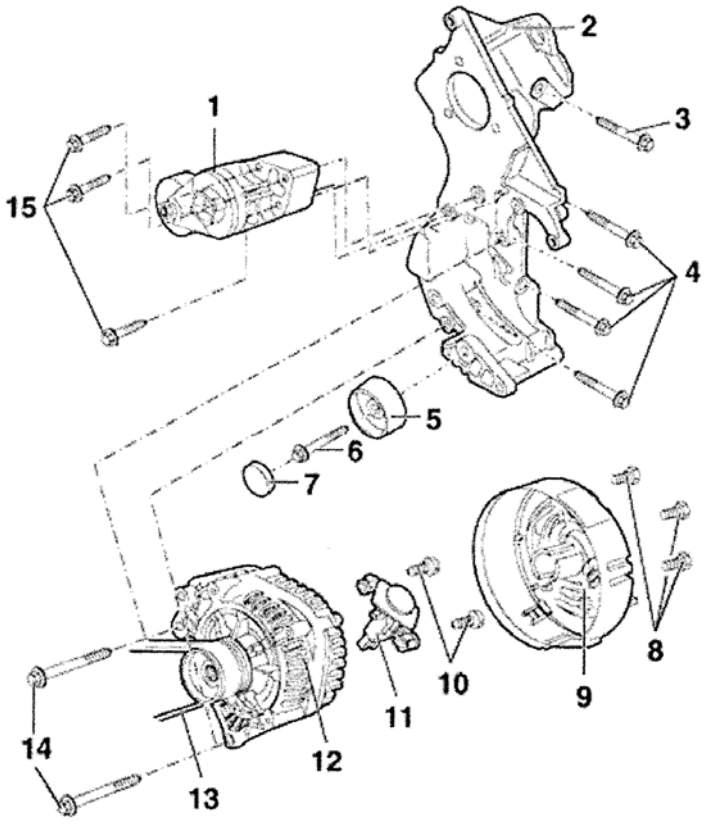
Fig. 38: Exploded View Of Generator (1.9L - TDI-PD)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



4-cylinder TDI engine with power steering and A/C compressor through 04.99 assembly

1 - Tensioner

2 - Bracket

3 - Hex bolt

- M10 x 45mm
- 45 Nm

4 - Hex bolts

- M10 x 65mm
- 45 Nm

5 - Relay roller

6 - Hex bolt

- M8 x 50mm
- 25 Nm

7 - Relay roller protective cap

8 - Hex bolts

- M3 x 18mm

9 - Protective cap

10 - Screws

- M4 x 25mm

11 - Voltage Regulator (VR)

12 - Generator (GEN)

13 - Ribbed belt

14 - Hex bolts

- M8 x 85mm
- 25 Nm

15 - Hex bolts

- M8 x 45mm
- 25 Nm

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Fig. 39: Exploded View Of Generator (1.9L - 4-Cyl. TDI)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
B+ Terminal Nut	10-21 (14-16)
Battery Hold-Down Bolt (Up To May 1999)	16 (22)
Belt Pulley Nut	43-48 (60-70)
Freewheel Pulley	59 (80)
Generator Mounting Bolt	
M8 X 45 mm, M8 X 50 mm, M8 X 85 Bolt	18 (25)
M10 X 45 mm Bolt	33 (45)
	INCH Lbs. (N.m)
Air Cleaner-To-Battery Platform	79 (8.9)
Charge Air Pipe Bolt (1.9L - TDI & TDI-PD)	89 (10)
D+ Terminal Nut	27-30 (3-3.4)
Power Steering Fluid Reservoir Retaining Clip Bolt	89 (10)

SPECIAL TOOLS

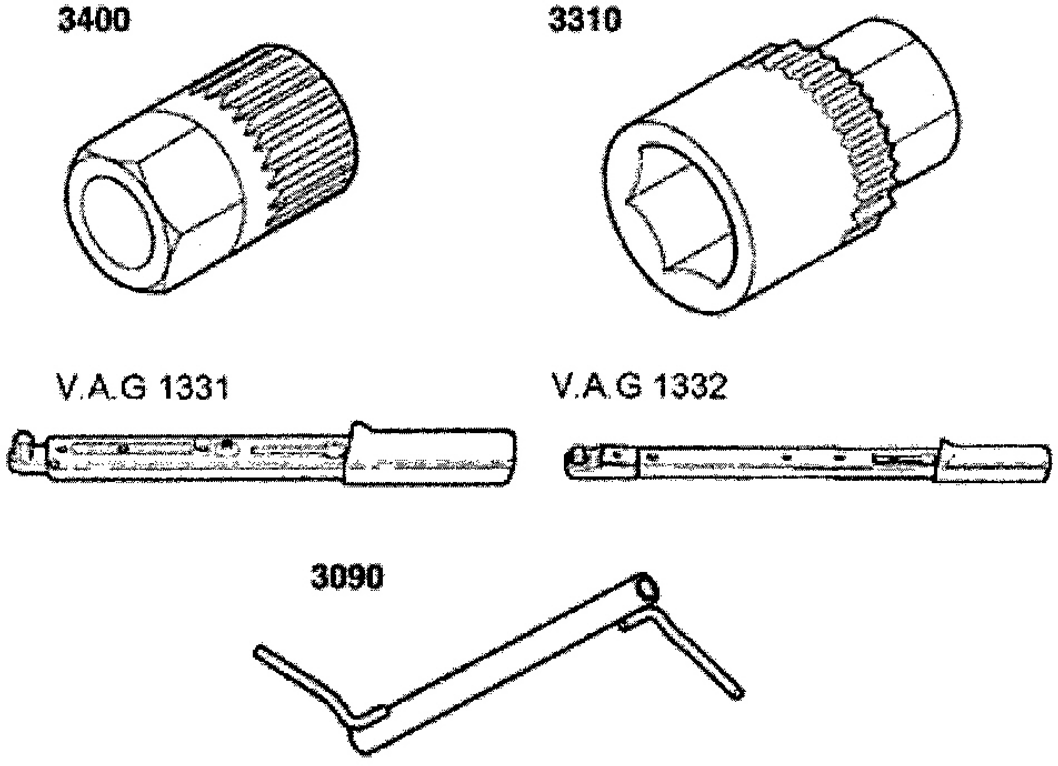

Fig. 40: Identifying Special Tools
Courtesy of VOLKSWAGEN UNITED STATES, INC.

WIRING DIAGRAMS

NOTE: **See CHARGING SYSTEM in appropriate SYSTEM WIRING DIAGRAMS article in ELECTRICAL.**